The Welding Engineer

Reg. U. S. Pat. Office

Founded by L. B. Mackenzie, 1916

AUGUST, 1930 VOL. 15, NO. 8

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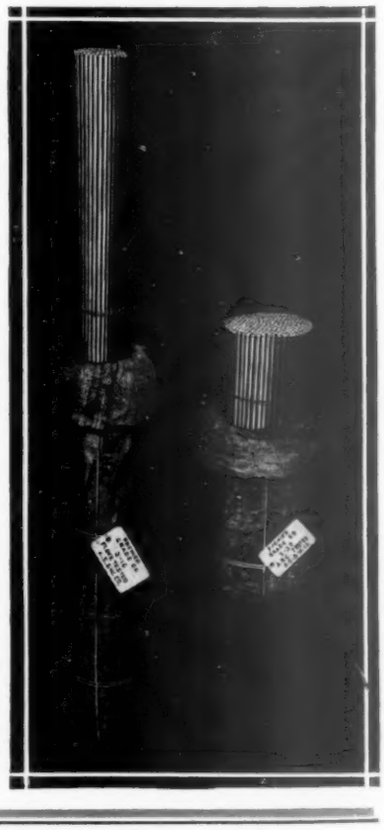

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844 Folsom Street

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Big Business

"Yassah," said old Link, "business very good. Done bought a pig fo' ten dollars, trade pig fo' a barrer, barrer fo' a calf, calf fo' a bicycle, and sol' de bicycle fo' ten dollars!"

"But yo' don' make nothin', Link!"

"Sho 'nough, but look at de business ah been doin'."—*Exchange.*

Big business is not always good business as illustrated by the above story. Business is good only when it is profitable. Any product which has real merit can be sold at a profit if sound merchandising methods are employed. When general business conditions drop a little below normal, the value of sound merchandising methods is almost immediately apparent. Those products which are made of good materials, with good workmanship, and which have had their reputation established by good advertising are the ones which are able to maintain their hold on the market without the necessity of swapping dollars to keep the wheels turning in the factory.

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The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

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Buyers' Index

Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

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Commercial Acetylene Supply Co.
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Hollup Corporation
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Bastian-Blessing Co.
Compressed Industrial Gases
Central Steel & Wire Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.

EVERYBODY'S BUSINESS

BY FLOYD W. PARSONS

LET us throw away our blue glasses and turn our eyes to the future. The things that threatened us a year ago have mostly been removed. The prospects we looked forward to with so much enthusiasm when business was booming, although nearly forgotten, are still awaiting development.

The Next Ten Years

There is no reason to change our opinion that we are coming to a tremendous expansion in the fields of chemistry, aeronautics, road building, motor transportation, farm electrification, gas distribution through long pipe lines, automatic business machines, and marketing. Almost before we know it we will once again be absorbed in making studies of new methods, new mechanical devices and new materials.

A multitude of infant industries will spring up all about us to absorb idle men and women as well as those released by new labor-saving machines. We always exaggerate good news during good times, and bad news during bad times. Business never gets as good as we think it is nor as bad as we believe it to be. Conditions are far less serious today than generally represented.

We now enter a new era better equipped with tools, methods and materials than ever before. Let us think not of the distant future and of fantastic dreams, but only of near realities. Let us picture a decade that will bring increasing precision on the part of workers; a greater linking of machines into continuous processes; a rapid widening of the system of interchangeable parts; and a multitude of new industrial applications for chemistry, physics, biology and other important arts.

The next ten years will be in fact, as well as name, an age of speed. The endeavor to increase materially the speed of ocean liners will mean new types of engines, the use of lighter and stronger metal alloys and hulls of modified form. Ship building, that is now leading the way in the recovery of industry, will carry the United States rapidly to that position of maritime importance justified by the wealth and power of the nation. Quickly we have risen to second place among the nations in ship-building, and very soon we will expand the present agreements which already call for 700,000 gross tons of ships costing more than a quarter of a billion dollars. The early result for us will be parity in merchant ships, and this is no less important than parity in warships.

Air travel right now leads all the factors governing the transition about to take place in American life. Our automobiles increased from 8,000 in 1900 to more than 25,000,000 today. The number of airplanes in use in the United States last year was approximately 9,000. Before the year 1940, we will doubtless be well on the way to many millions. The rate of progress will depend on the development of fool-proof planes. The perfection of machines that will ascend and descend vertically will quickly make travel by plane the universal practice.

The spread of travel by air will bring a radical revision in the viewpoints of railroad managements. The rail carriers will be forced to recognize that they must prepare to carry freight and passengers by every possible means. We may even expect some of our forward-looking railroads to become interested as owners in big pipe lines transporting natural gas, oil, gasoline and various other products.

Demand for air travel is now growing about as fast as facilities can be provided. People are losing their fear of this mode of transportation. The cost of travel has been reduced from 11 cents per mile to a little less than 8 cents. In some sections, particularly California, the air fare has been cut to a figure that parallels the rail fare. Bearing in mind that the present rate of growth of air travel is 100 per cent a year, we may with good reason entertain the idea that before the present decade is ended, planes and dirigibles will be carrying more passengers in the United States than railroads.

The plotting of automobile facts 20 years ago produced curves which, when extended, appeared to be impossible of realization. A similar consideration of air travel leads to the belief that before ten years have passed aircraft will have made the United States one community. Business people will think nothing of covering 10,000 miles in a month. Executives will go 1,000 miles to keep appointments with no more thought than is now given to a ride of 50 miles by rail. We must prepare to regard journeys by air as no less safe, and more comfortable, than by train, automobile or ship. Department of Commerce figures show that even now only one life is lost in 191,500 miles of civil aviation against one life in 172,768 miles of rail travel.

There is nothing fanciful in the prediction that the average person in two or three years, having only a couple of weeks available for a vacation, will be able to spend most of his days at the other side of the continent or overseas. The belief that poor people would not be able to own a motor car was fallacious. The idea that the airplane will not be brought within the reach of the masses is doubtless equally in error.

Changes in the fields of fuel and power will probably rank second only to aviation in extent and importance in the next few years. A careful survey indicates we will be consuming 2,000,000 gallons of gasoline every hour in 1940.

Already we have 80,000 miles of fuel pipe lines in the United States and the building of super-lines is just getting under way. A short time ago a million dollars seemed a lot of money to invest in a pipe-line project. Now come lines a thousand miles or more in length and costing $100,000,000. These great systems will cause radical changes in the merchandising methods and prices of all forms of energy.

The next ten years will record fuel advances that probably will never be equalled in the future history of the world. Oil wells will be drilled to a depth of 10,000 feet. Improved refining methods will substantially increase the yield of gasoline from oil. We will see a large production of motor fuel by the hydrogenation of coal. The new Leuna plant in Germany is expected very soon to be on a production basis of 100,000,000 gal. of gasoline annually. This means that notwithstanding our present surplus of gasoline, we must face the possibility of substitute liquid fuels.

Cheaper and more abundant heat and power for everyone will extend the machine age to rural as well as urban America. In this decade we will reach the limits of the development of steam power. We will witness the realization of the dream of coal carbonized at the mines. We will see smokeless fuels take over the heating job of the entire nation, thereby saving property and health.

Amazing opportunities now lie before us. Fortunes will be made in the speeding up of travel; in developing the possibilities of cellulose; in extending the uses of refrigeration; in getting values from our unexploited desert land and the territory of Alaska; in building up great markets in the Far East, and in extending the use of electric locomotion.

Of immediate interest is the change that is taking place in our food industry. People were prejudiced a few years ago

(*Concluded on page* 44)

a super machine in a world of wonderful machines

BURKE ARC welders

Every requirement for the best in effective and satisfactory Electric Arc Welding is fulfilled in BURKE Welders. They are, without a doubt, the most advanced Welders that enginee: ing science and practical experience have been able to produce.

Their design and construction gives to them welding characteristics which enable the operator to hold a stable short arc with minimum physical strain.

Producing a short arc of maximum stability and proper intensity the heat is concentrated in the smallest possible area, thus an ideal welding condition is maintained at all times.

Compact in design—sturdy in construction—welded steel frames—splash proof—protected from external injury—impossible for pieces of metal (and other foreign matter) to fall into working parts and being semi-enclosed they are protected from the elements.

These features with the following 5 BURKE Strong Points: (1) CONTROL LEVER, easily accessible, makes possible instant adjustment to the most efficient welding current; (2) GRADUATION OF CURRENT—an infinite number of steps in current control are made possible by one control lever; (3) STRIKING THE ARC is always the same regardless of the current setting; (4) SAME CHARACTERISTICS OF WELDING ARC throughout welding range; (5) SELF EXCITED GENERATOR—built into the machine; make BURKE Arc Welders a super-machine in a world of wonderful machines.

BURKE ENGINEERS will be pleased to consult and advise with you—they stand ready to help you just as they are helping manufacturers all over the country to become familiar with the efficiency of Arc Welding as applied to their businesses. Thus assuring them of the proper equipment for their special needs, be it production or maintenance. Send for a BURKE ENGINEER.

BURKE ELECTRIC COMPANY

Main Office and Works: ERIE, PA.

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES

EDITORIAL

When Standard Specifications Are Satisfactory

DURING the past ten years the American Welding Society has accomplished a great deal in the direction of preparing standards and specifications for the guidance of those who are using the various welding processes. Meanwhile, other organizations have been interested in the matter of adopting standards and specifications applying to the use of the welding processes in individual industries. It is going to require considerable cooperation to prevent occasional conflicts in standards. Such conflicts might not mean a great deal to the final result, but might easily cause controversies involving an unnecessary waste of time. At the recent meeting of the Association of Railway Electrical Engineers, that organization took the very sensible point of view that it was not necessary to compile a specification covering electric-welding equipment for the reason that such a specification already existed and appeared to be not only satisfactory but in general use. It was further suggested that in case the present specification, which has been agreed upon by the manufacturers of electric welding equipment, should seem to need revision that the most desirable action would be to call upon the equipment manufacturers to consider making such a revision in their own specification. Altogether, this is a constructive and logical point of view. Wherever local or national organizations are considering the subject of standards of any kind, they should by all means make a thorough investigation of existing standards, and if the latter do not appear to fill the bill, some investigation should be made to find the reason. In other words, every attempt should be made to prevent confusion and conflict in the development of the present trend toward putting the application of welding on a systematic basis.

A New Possibility of Redesign

THE rubber companies, by getting acquainted with the steel companies and cooperating with them, have developed an idea which promises to be of increasing interest to production welding departments in the future. Considerable publicity has been given to the fact that several automobile companies are using a running board which consists of a rubber tread bonded to fabricated strip steel by vulcanizing. It is a simple and sturdy construction and easy to handle. The rubber coating on the steel offers the advantages of waterproofing and resistance to corrosion. This is an idea which is certain to appeal to manufacturers of other articles where it is desired to have the strength of steel combined with the waterproofing properties of rubber. In due time the process will be extended to more complicated things than running boards. In other words, we will have fabricated assemblies with the rubber coating applied after the assembly is made in order to make sure that the coating shall be uniform and continuous. This will certainly call for a welded assembly, since any other type of assembly in which connections might possibly work loose in service would scarcely be satisfactory, because if there were any loose parts, the rubber coating would probably not last very long. In some cases the coating will be for the purpose of providing insulation, and again it is obviously desirable to provide the solid foundation which the welded assembly offers. There is certainly a big future for rubber-coated steel, and welding is sure to play an important part in many of the applications which are found for it.

The Future for Production Welding

A COMPREHENSIVE survey made by the Trade Research Division of the National Association of Flat Rolled Steel Manufacturers places at 161,000,000 tons the ultimate goal of the flat rolled steel industry in ten important consuming fields. The survey mentioned shows a possible annual tonnage for flat rolled steel in these few markets of more than eight million tons, which is over three times the present annual tonnage. This association, which has made such a thorough survey of market possibilities and finished with such a promising picture of the future outlook, is not neglecting any opportunity to assist its manufacturers in realizing on all of this undeveloped business. The association is creating greater consciousness of steel and at the same time broadening the use for steel products. The ten markets included in the survey are those represented by office furniture, household furniture and equipment, automobile wheels and bodies, pressed and welded steel parts, shelving and bins, steel lath, steel buildings, building materials, electric light and telephone poles, and the farm market. In some of these industries welding has played only a small part in the past, and in others welding has been a vital factor, but the process certainly has a place all the way through the list at the present time. It will probably become increasingly important in future years. This association which has built up a picture of consumption of steel amounting to one hundred and sixty-one million tons is building a big future for welding and it will be profitable for those who are interested in the extension of welding activities to watch carefully the activities of this group.

Not Like the Good Old Days

IT is said sometimes that the making of fact-finding surveys is one of the bad habits of American business men. The endless procession of questionnaires is criticised by the same people who are most hungry for the information which such questionnaires are apt to yield. Each individual undoubtedly receives some requests for information which seem unnecessary, but that is probably because of the fact that some guess work had to be used in making up the mailing list. A rather informal survey on a small scale recently conducted by the publishers of *Printers' Ink* turned up some information which is certainly worthwhile. The editor who compiled the report recalls that out of fifty employers present at an unemployment conference held about ten years ago, all of them either wanted wage cuts or were unwilling to go on record against them. Just recently the question of wage cutting was presented to a number of the largest corporations in the country and almost without exception the presidents of these corporations emphatically announced that they did not contemplate any reduction in wages at the present time, the majority of them indicating that they considered such an action to be a very unwise policy. This is certainly something for the old timer, who hankers for the good old days, to think about. Furthermore, the definite stand taken by the world's largest industrial plants should serve as a good example to the manufacturers and other employers having smaller pay rolls. The new economics teach that it is poor business to cut wages; that only by maintaining wages can a high standard of living be maintained; and that a high living standard is a requisite to commercial prosperity.

Strong Welds

The strength of a weld depends primarily upon the quality of welding wire used. Roebling Welding Wire is manufactured to meet the most rigid specifications. It is uniform in quality throughout each shipment and throughout all shipments.

There is a growing realization that the very best welding wire obtainable should be used, as the unit of cost of the wire itself is very small when compared to the total cost of the welding job. If you are not using Roebling Welding Wire, it amply merits your consideration.

John A. Roebling's Sons Company
Trenton, New Jersey

ROEBLING

WELDING WIRE

Welding in Interior Ornamental Work

The Spot Welder and the Torch Cut Costs of Ornamental Work Built Up of Sheets of Rust-Resisting Metal Cut to Special Designs

THE use of welding in the fabrication of exterior ornamental iron work has been rapidly growing in popularity during the past few years. In fact, the successful use of welding for railings, gates, balconies, decorative furniture, and similar items by firms specializing in the ornamental-iron field have led quite a number of job welding shops to the adoption of a small amount of ornamental iron work as a sort of sideline, and those who are artistic enough to develop satisfactory designs have done very well with it.

Welding has also been used on a large scale in the fabrication of metal interior decorations on a production basis. The advantages are a combination of reduced fabrication cost with the possibility of getting ornamental effects which would not be possible without the aid of welding in construction.

The photographs used in this article illustrate a rather unusual and very successful application of welding for interior ornamental work on a very large scale. They show some views of the Union Trust Building in Detroit, Mich., and illustrate a few of the steps in the fabrication program which was used to obtain this artistic and unusually effective scheme of decoration. Most of the metal work illustrated in pictures of the main entrance, counters, and tables is monel metal.

The cost of producing the shapes illustrated, by casting or by machining from thick plates, would obviously be prohibitive. The only way it could be done at a reasonable cost was to build these sections up in the form of laminations. For the assembly of these laminations there is, of course, a choice between welding and riveting. If riveting were used, special precautions would have to be taken to obtain the accuracy which is of first importance in work of this kind, and there would be the added disadvantage of the rivet heads showing even if they were countersunk.

The sheets being cut out in certain designs and these being superimposed one upon the other, this turns out to be an ideal job for the electric spot welder, which was, in fact, the agent chosen for this particular architectural treatment. It turned out that this method was extremely desirable and economical. This was a job involving a large

Bank Floor With Main Entrance in Background and Check Tables in Center.

How the Ornamental Design Is Carried Out in the Tellers' Windows.

(Upper) Gas Welding Some of the Assemblies. Two Tellers' Windows Nearly Completed.
(Lower) Making Templets for Cutting Sections. How the General Design Is Carried Out in the Construction of the Tables.

amount of detail with hundreds of miscellaneous connections. A good many of the connections were of a nature that could not be handled on a spot welder, and for these cases the oxy-acetylene torch was used.

The beautiful effects which it is possible to obtain by using monel metal for such purposes as this are well known, monel being a nickel-copper alloy which takes a bright polish and is not subject to rusting. The metal does not present any serious difficulties from the standpoint of the spot welder, it being possible to use any standard machine on the work. When using this process, it is not easy to get the high-strength welds which are obtained with mild steel, and the welder has to learn by experience how to avoid burning at the contact points.

The best way to avoid burning is to make sure that the pressure is on the metal before the currrent is passed through the work, because if there should be an air gap between the metal and the spot-welding electrode the chances are very good that the sections involved will be only partly welded. A careful operator soon learns to take care of this point of procedure; and as far as ornamental work is concerned, the welds are readily made to show many times the strength which is actually required of them.

One of the illustrations shows the main entrance with the row of tellers' windows extending down one side of the main floor. A few of the other illustrations show close-up views of the tellers' windows and of the desks, which are placed lengthwise in the center of the floor. Another view is given to show how the sheets are cut into the necessary shapes for assembly, and there is also an illustration of a gas welder at work on some of the small assemblies. It is plain from these pictures that the designers were depending upon these methods of welding to carry out their decorative ideas in such a way as to get a perfect result.

Close-Up View of Main Entrance.

This work was done by the Bronze Division of the Gorham Company, Providence, R. I., to whom acknowledgment is made for their courtesy in furnishing the illustrations and data for this article.

Welding Progress on Display

Welding Demonstrations, Technical Discussions, and the Activities of a Great Steel Fabricating Center Comprise the Attractions of National Metal Week

IT IS expected that over 60,000 plant executives and engineers will visit the National Metal Congress which is to be held in Chicago during the week of September 22nd. With the exception of the fall meeting of the American Welding Society, all the events will be held at the Stevens Hotel.

The American Society for Steel Treating has scheduled sessions on sales problems, corrosion-resisting metals, nitriding, forgings, steel melting and carburizing. Two other sessions will be devoted to miscellaneous topics, and a third to papers dealing with theoretical metallurgy. The Campbell Memorial Lecture, to be delivered by M. A. Grossmann, vice-president of the Republic Research Corp., will be on "Oxygen in Steel."

The American Institute of Mining and Metallurgical Engineers will sponsor two sessions on the beneficiation of iron ore. These will be led by C. B. Murray, consulting chemist of Cleveland. The rest of the sessions is divided into a well-rounded program of papers dealing with ferrous and non-ferrous topics.

A session on combustion problems and furnace design is a high light of the American Society for Mechanical Engineers program. The molding of phenol materials will be discussed in detail at another session. Polishing and nitriding are also on the program.

The American Welding Society will hold its technical sessions at the Congress Hotel, which is only a couple of blocks distant from the Stevens. One session of this program which is expected to draw a large attendance will be devoted to the welding of structural steel. The more fundamental subject of testing welds will be covered in a symposium which is planned to fill a complete session. One of the morning sessions will be devoted to problems involved in railroad welding. There are a number of other subjects, including welding of alloy steels and nonferrous metals, for which papers have already been arranged.

On the whole, the amount of attention given to the subject of weld testing on this program is impressive. There is an increasing demand for articles of welded construction, and manufacturers of metal articles have become so well acquainted with the advantages of welding that they are trying in every possible way to make the fullest use of the various processes. In all cases, however, they are aware of the importance of quality in welding; so that while they are anxious to go ahead, they are equally anxious to avoid failures. The program committee has made its plans to furnish papers which discuss practically every known method of testing welds from every angle. The result should be that manufacturers will learn just how far it is possible to go in obtaining complete control over the quality of their welding operations. It is a program which has in it a great deal of practical value for every firm using welding of any kind on a production basis.

At the National Metal Exposition, which is to be held in the Exhibition Rooms of the Stevens Hotel during the same week, there will be a special section devoted to welding. In this section there will be operating exhibits of all the welding processes, a total of about twenty-five different manu-

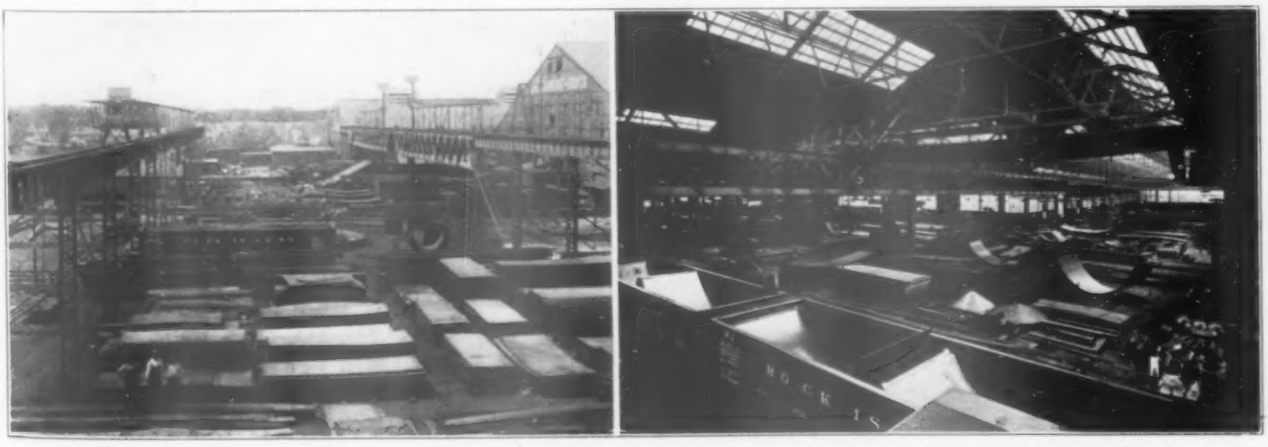


Photo by courtesy of Chicago Bridge & Iron Works.

Stock Yard and Working Bay in a Plate Fabricating Plant.

facturers of welding apparatus and welding supplies being represented. Later announcement will give more detailed information regarding the character of the individual exhibits. The Exposition will be open from 10 a. m. to 6 p. m. on Monday, Wednesday, and Thursday, and from 12 noon till 10 p. m. on Tuesday and Friday.

The city of Chicago makes a splendid setting for National Metal Week. This is particularly true as regards those who are interested in welding. It is a generally known fact that nearly three-fourths of the welding done is on steel, and the

P. & A. Photo.

Chicago Steel Mills at Night, Making Work for Welders.

Chicago district is itself a great steel-producing and steel-fabricating center. The rate of expansion of the steel industry in Chicago has been phenomenal, and in fact is said to surpass that of the country as a whole.

Twenty-five years ago the output of steel in the Chicago area was about 9% of the total produced in the United States. In 1929, however, the production in the Chicago district was 23% of the total amount of steel manufactured

Welding Engineer Photo.

Welded Piping in a Railroad Yard.

in the nation. While the national steel production has increased 150% during this period, the Chicago production has increased 350%. Two factors have contributed to this amazing growth—an adequate producing capacity and the selection of this district by industry as a point of economical distribution.

Many transformations have taken place in steel-plant facilities and methods. Steam-driven units have been abandoned for electric drives; furnaces and mills have been replaced by modern units designed for much greater and more economical production. These changes involved large capital expenditures which resulted in reduction of costs, permitting an increase of more than 250% in the minimum wage rate with an advance of only 40% in the average realizing price for steel.

A glance at the changing distribution of steel will be interesting from a welding standpoint. In 1905, 20% of the steel produced in the United States went into rails for the railroads; and the aggregate consumption by the railroads amounted to more than 40% of the total steel production. Today, the use of steel is distributed approximately as follows: Automobile industry, 18%; building and construction, 16½%; railroads, 16%; oil, gas, water and mining, 9½%; agriculture, 6½%; exports, 6½%; containers, 5%; machinery, 3½%; and all other forms, 18½%.

The per capita consumption of steel 25 years ago

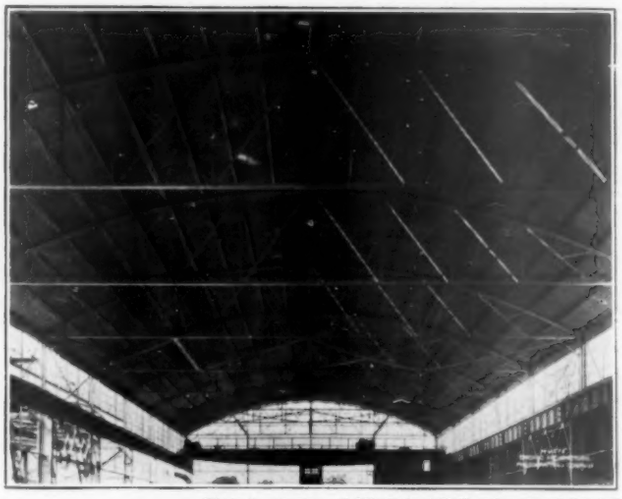


Photo by courtesy of Mississippi Valley Structural Steel Co.

Welded Steel Building Which Houses Elaborate Equipment Used for Structural-Steel Welding.

amounted to about 300 lb. The figure is now approximately 600 lb. It is obvious on reference to the distribution figures that the increased consumption of steel is in fields where the welding processes are being used on a constantly enlarging scale.

There are ten major steel-producing plants in the Chicago area, and their production in 1929 was approximately 10,000,000 tons. The Gary works of the United States Steel Corp., located only an hour away from the business district of Chicago, is rated as the largest steel-producing plant in the world. The whole steel industry in the Chicago

Photo by courtesy of Chicago Steel Tank Co.

Acres of Welded Tanks.

area is said to provide work for approximately 75,000 men, with a total payroll of about $150,000,000 per year.

In addition to its importance as a steel center, Chicago is a great transportation and distribution center. Consequently, it is easily reached from all sections of the country. Its hotels are accustomed to the accommodation of large national conventions, and every facility is provided by the organizations sponsoring National Metal Week to assure the comfort and convenience of members and guests.

Those who are particularly interested in welding can be sure that the welding activities in the metropolitan district of Chicago are worth knowing. Opportunities will be provided for inspection trips to some of the best known welding departments in the city, and the Chicago Section of the American Welding Society is making elaborate preparations to assist visitors in every way to get the greatest value out of their visit to the city for National Metal Week.

WELDING USED TO GOOD ADVANTAGE ON BINS AND BATCHERS

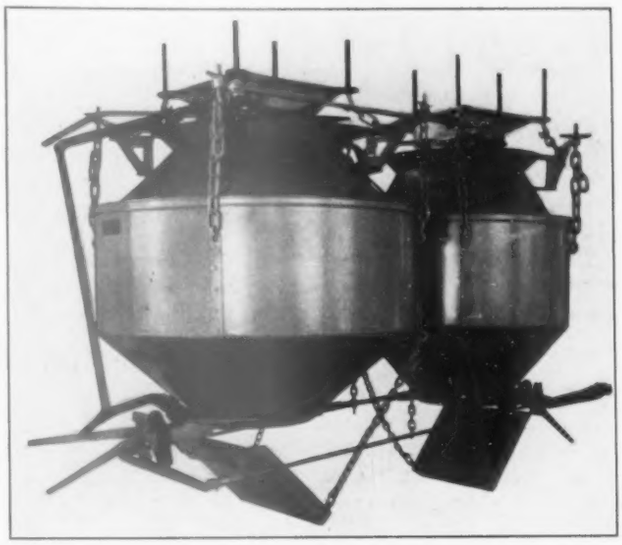
The equipment manufactured by the C. S. Johnson Company, Champaign, Ill., covers a complete range of bin and batching units for material yard, central mixing plant, and batching plant service. Bins are made in three distinct types—demountable, box and column, and octo bins. Batch-

Welded Batcher With Scale.

ers are made in both volume and weight proportioning types for sand, gravel, stone, and cement and the line includes the "hydrogravic" batcher, which is a patented method of weighing sand and water together in order to take advantage of the water content in the sand and make it possible to follow more closely the water-cement ratio.

In the construction of this equipment, welding is used practically throughout on all hoppers and batchers. Through a period of years they have found that these hoppers will give exceptional service and there have been a number of cases where they have been found in use for over five years and are still in good servicable condition. This is a splendid showing for equipment of this character, considering the rough usage which it gets in service.

The illustrations show two types of scale batchers. These are a combination of volume batcher and a scale attachment, giving a dual result of both weight and volume measurement. The scale construction is of cast steel, brass and bronze parts, no cast iron or breakable material being used. The illustrations show clearly the location of some of the more important welds. Welded construction adds to the ease of operation and durability and yields a greater capacity with less weight than any other type of construction. One feature of the work, which is noticeable in the illustrations is the nice appearance of the finished job and the freedom from any indication of warping or buckling of



Service Records Prove That This Welding Is as Good as It Looks.

the material. It is a fine indication of the good results which can be obtained by welding when the process is used under careful supervision.

ARC WELDING BUILDS SAFETY INTO AMUSEMENT RIDES

By M. W. Sellner,

Treasurer, Sellner Manufacturing Co., Inc., Faribault, Minn.

Manufacturers and operators of amusement rides and devices are doing their utmost to secure the greatest safety

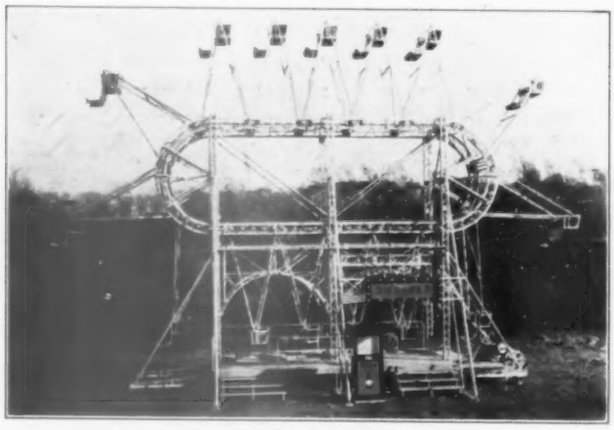


Fig. 1. The "Swooper" Ride.

for their patrons and thereby protecting their own interests. They realize the dangers connected with the operation of these devices, and are fully aware of the damage to be done by only one serious accident. It is not strange therefore that manufacturers of this equipment should turn to arc welded construction in the fabrication of their products because of the increased strength and rigidity afforded by the use of this modern process of joining steel.

The accompanying photographs show two interesting amusement rides built by our company which have gained popularity because of their sensational performance, both of which are built largely of arc welded steel to insure maximum safety. The high ride shown in Figure 1 is the

"Swooper." It is similar in action to a Ferris wheel, yet the strains and stresses encountered in operating a product of this type are more pronounced, due to the long sweeping action of the cars as they travel across the upper and lower tracks of the structure. In the design of this ride an effort was made to keep the shifting weights and stresses balanced as nearly as possible, but this was not entirely possible due to the fact that the mechanism travels in one direction continuously.

The "Tilt-A-Whirl" is shown in Figure 2. The action of this ride is similar to that of a "Merry-Go-Round" with the added rising, falling and swinging motion of the cars while the ride is in operation. Here again the shifting weights and stresses make it difficult to compute the sizes of members and bracings to be used, and the exact location to place them.

In the construction of these devices the electric arc welding process simplifies the problem of stresses and weights, since all permanent joints, both on the portable and stationary types, are arc welded. The entire frames are fused together, making the sections of the portable type, and the entire frame of the stationary type, one integral steel unit. In assembling the portable rides the arc welded sections are securely bolted together, thus giving maximum strength to the assembly. The welding current used in the manufacture of these amusement rides is furnished by "Stable Arc" welders, manufactured by The Lincoln Electric Company, Cleveland, Ohio.

Fig. 2. The "Tilt-a-Whirl" Ride.

The great variation of motions and consequent shifting of weights and stresses make it an extremely difficult task to build amusement rides such as these. The electric arc welding process simplifies this difficulty, however, by fusing the metals of the frame together at the joints, making them as strong as the metal they join, thereby giving them maximum safety.

INSTITUTE OF METALS TO HOLD MEETING IN SOUTHAMPTON

The Southampton meeting of the Institute of Metals, to be held by invitation of the mayor and corporation of Southampton on September 9-12, promises to be exceptionally interesting—judging by the program of the meeting that has just been issued by the secretary.

The proceedings will be opened on September 9, when the Ninth Autumn Lecture will be given by Professor D. Hanson, D.Sc. (vice-president), on "The Use of Non-Ferrous Metals in the Aeronautical Industry."

On September 10 the proceedings will open at the unusually early hour of 9:30 a. m., when a civic welcome will be given to the members by the mayor of Southampton in the Chantry Hall. Following this official opening of the conference the members will spend three hours discussing half a dozen metallurgical papers, several of which will be contributed by distinguished metallurgists from abroad.

Following a luncheon at the South Western Hotel visits will be paid during the afternoon to Portsmouth dockyard (by steamer), Romsey Abbey and Winchester (by motor coach), the Supermarine Aviation Works at Hythe and Woolston, and the Ordnance Survey Office. In the evening there will be a reception and dance in the Royal Pier Pavilion by invitation of the mayor and corporation.

On September 11 the members will resume the discussion of papers at 9 a. m., and at 12:30 p. m. the "business" side of the conference will be formally concluded, when members and their ladies will be conveyed to R. M. S. "Mauretania" where they will be entertained to luncheon on board by invitation of the Cunard Steamship Company.

CALIFORNIA SCHOOL OF WELDING ENLARGES ITS FACILITIES

An attractive little catalog just received from the California School of Welding, which is located at 1834 Howard St., San Francisco, indicates that the teaching facilities of this school have been continually improved. The school catalog gives a very interesting review of the importance of the various welding processes in the industrial world, and a set of well-chosen illustrations gives a picture of the great variety of work accomplished by means of the torch and the arc. In this school the students can take either electric welding or oxy-acetylene welding, or a combination course. Classes are held daily, the school being open from eight in the morning until five in the afternoon. Night classes are held on Mondays and Thursdays. The school is completely equipped for teaching both welding processes, and has enjoyed a continuous patronage since it was started in 1926. Students have been enrolled from all states west of the Rocky Mountains and from foreign countries, and the records indicate that men who have received training there are employed in nearly every state in the Union.

Gas and Electric Departments of the California School of Welding.

Bronze - Welding Procedure

The Repair of a Rolling - Mill Casting Is Described to Illustrate How Bronze Welding Can Save Much Time and Money in the Plant

INDUSTRIALISTS who employ machine equipment are continually faced with embarrassing delays to production and contingent expense due to the breakdown or failure of machine parts.

Welding, particularly bronze welding in the case of castings, is the answer to the repair problem. In the majority of cases it is no longer necessary to buy a new part from the manufacturer and wait days or even weeks for its delivery. An experienced welder can usually repair the job, in place, in a matter of minutes or hours. When properly executed a bronze weld is even stronger than the base material.

The question often arises in the mind of the welder just how far he can go in welding heavy cast iron sections with bronze. An interesting repair job which answers this question is shown in the accompanying illustrations and described as follows:

A 20-inch rolling mill in the plant of a Connecticut manufacturer was seriously damaged through being subjected to extremely heavy duty which cracked the head of one of the supporting frames. The casting weighed approximately six tons and the crack extended directly across the width of the head to a depth of 5¼ inches on one side and 9¼ inches on the opposite side.

At first the purchase of a new casting seemed necessary at a cost of approximately $800 and a delay of from two to three weeks for delivery. After consulting an experienced welder it was decided to repair the frame in place with Tobin bronze.

The breakdown occurred on a Friday morning and the complete job of preparation and welding was finished Sunday afternoon at three o'clock. This meant a great saving because it enabled the rolling mill to enter service at seven o'clock Monday morning and eliminated a serious delay to production.

Fig. 1. Casting With Break Prepared.

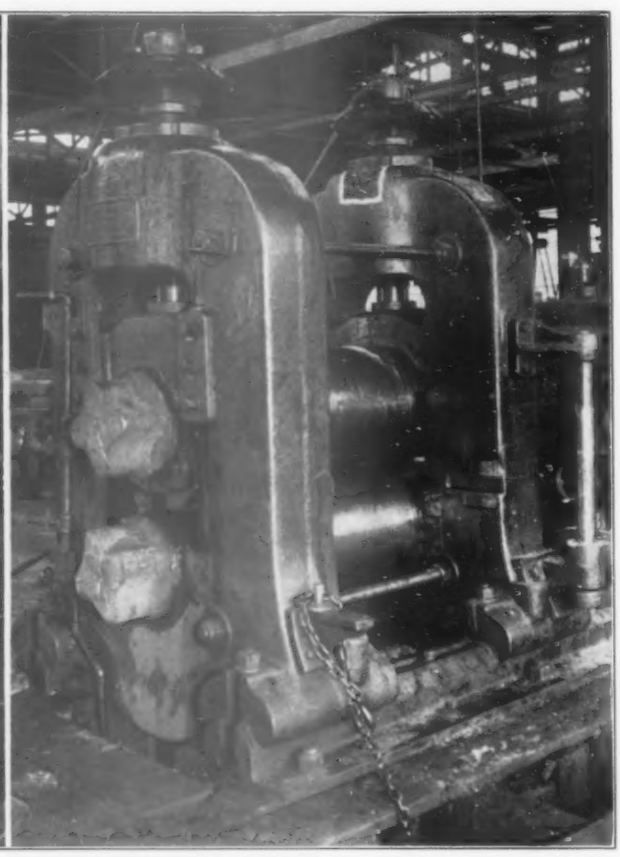


Fig. 2. How It Looked After Welding.

A description of the preparation and welding process follows:

A V-shaped wedge was cut to the full depth of the crack, which extended across the top of the frame housing. On the left side of the head the cast iron was drilled and chipped away in the shape of a pie wedge 5¼ inches deep and approximately 5½ inches at the widest part of the sector, with the bottom of the V extending within ⅝ inch of the wall of the center hole which contained the sleeve for a huge set screw used to pinch the rolls. Drilling and chipping was carried out in a similar manner on the opposite side of the head which was cut away to a depth of 9¼ inches and a width of 5½ inches.

The entire time of preparation for welding was 11½ hours and required a crew of four men.

Successful bronze welding of large heavy castings is attained only when the members to be welded, either cast iron or steel, are thoroughly heat-soaked in order to take the chill out of the base metal. Pre-heating of the entire frame head was resorted to in order to minimize any danger of warping or cracking during the welding operation. This was accomplished by building a furnace of fire brick around one side of the frame and confining the flame of a crude oil torch to the welding areas and the surrounding mass until thoroughly heat-soaked. The opposite side of the frame was then pre-heated in a similar manner. This operation required 3½ hours.

During the welding operations the heating torch was applied to the opposite side of the head on which the work was being done. This procedure equalized the heat on both sides of the casting and prevented any danger of cracking, as was evidenced by the complete success of the finished job, which did not show a check or blemish.

of thinning perfectly ahead of the weld and flows like water, permitting proper puddling at the will of the operator.

When the welding of one side of the head was finished the operation was carried out in a similar manner on the other side.

The actual welding time was 5½ hours, which does not include the time taken for rest intervals by the operators. Materials used include approximately 130 lb. of Tobin bronze, 800 cubic feet each of oxygen and acetylene and 12 gallons of fuel oil for pre-heating.

The top of the casting was then covered with heavy asbestos slabs to allow the casting to cool and shrink slowly to its former alignment. On the following Sunday morning the casting was sufficiently cooled to permit re-assembling of the top gear, and all parts were found to slip into place perfectly.

Illustrations 1 and 3 were taken after the preparation had been completed and 2 and 4 after the welding job was completed with assembly in place. Immediately after the photographs were taken the welded areas were smoothed

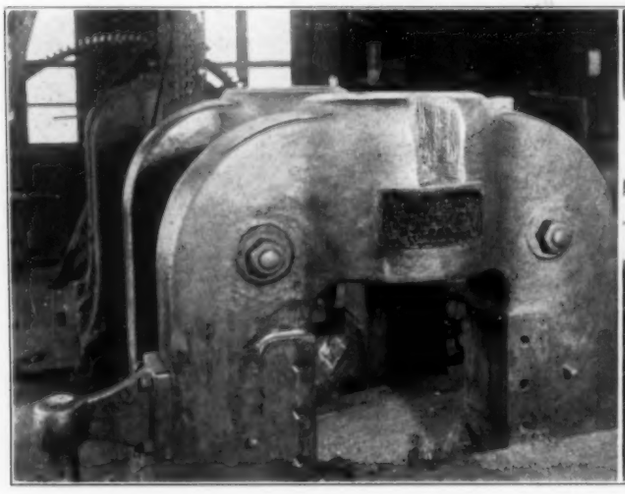


Fig. 3. Front View of the Fracture With Beveling.

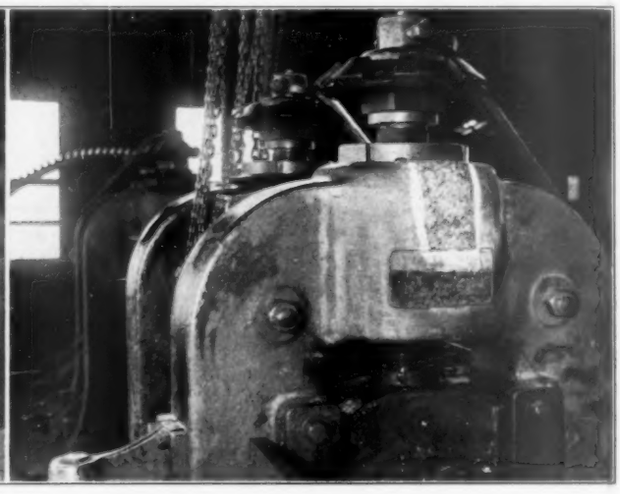


Fig. 4. Ready for Action Again.

The welding operation was conducted by a crew of three men, one man to attend to the oil torch and to serve as helper, while two men handled welding torches and built up the bronze in the weld. During welding two tips were used, a number 12 and a number 15.

It is essential in completing a bronze weld of any description to bring the welding areas to a cherry red heat in order to assure the proper adhesion of the bronze. This was accomplished by playing the inner cones of the torches with neutral oxy-acetylene flames directly on the welding areas. The bronze was deposited at the bottom of the cut and built up in successive layers until the top of the casting was reached. The use of two torches permitted the work to progress very rapidly, the welders depositing metal at a rate of from one to three rods at a time. It was observed that the bronze built up at the rate of about 3 inches an hour. A good commercial flux was used.

When using bronze, welders sometimes make the mistake of burning the rods by applying the inner cone of the oxy-acetylene flame directly to the bronze material. This is a great mistake and is never done by a welder experienced in bronze. The bronze should always be melted by the outer envelope of the flame, the inner cone being held anywhere from ¼ inch to ½ inch away from the bronze, at the discretion of the welder.

When the correct heat is applied, bronze has the property

down to the previous contour of the cast iron frame and painted, presenting a perfectly finished appearance. The saving to the manufacturer included approximately two-thirds of the cost of a new frame as well as a production loss of two or three weeks.

The welding work was done by Mr. Charles Gallo and assistants of the J. L. White Welding Company, Waterbury, Conn.

TWO WELDING CIRCULARS ISSUED BY STEEL INSTITUTE

"Some Applications of Welding to Steel Structures," by Henry Penn, which appeared in the May, 1930, issue of *Engineering and Contracting*, has been reprinted in leaflet form by the American Institute of Steel Construction for general distribution. This article describes how I-beams and plates were welded together to form a machine base in one case and a 10-ft. bolster for a twin deck-girder span in another. Advantages of this construction over castings are cited.

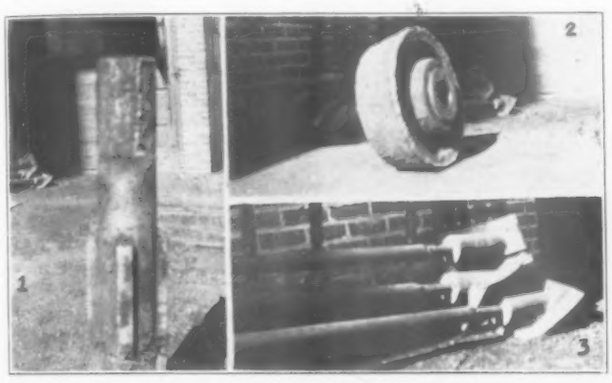
The Institute is also sending out reprints of a paper entitled "Design of Joints for Welded Steel Structures," by Andrew Vogel, which was presented before the annual meeting of the American Welding Society on April 25, 1929. The calculation of stresses and length and size of welds for different types of joints are explained.

Big Savings on Small Jobs

Whether the Job be Ornamental Iron, Pipe Railings, Lintels, or Worn Shafts, This Shop Finds How to Make Them Better and Cheaper by Welding

By F. H. Marsh*

WHEN reading the stories of large achievements in welding progress such as fourteen story buildings, hundreds of miles of pipe line, steel hull barges, etc., the average structural fabricator probably is left with a feeling of admiration, and perhaps even envy for those who have the opportunity to participate in such spectacular work. However, there are also many things which are being done in increasingly large ways by moderate sized plants, such as ours.



(1) Built-Up Shaft. (2) Built-Up Wheel Tread. (3) Welded Pavement Smoothers.

We operate a plant made up of a gray iron and semi-steel foundry; jobbing machine shop, ornamental iron shop and structural steel shop. We have four portable arc welders, two 200-amp. and two 300-amp. We have so wired our plant that these can be moved to many different locations and so arranged that we need not use from any location more than a 200-ft. cable.

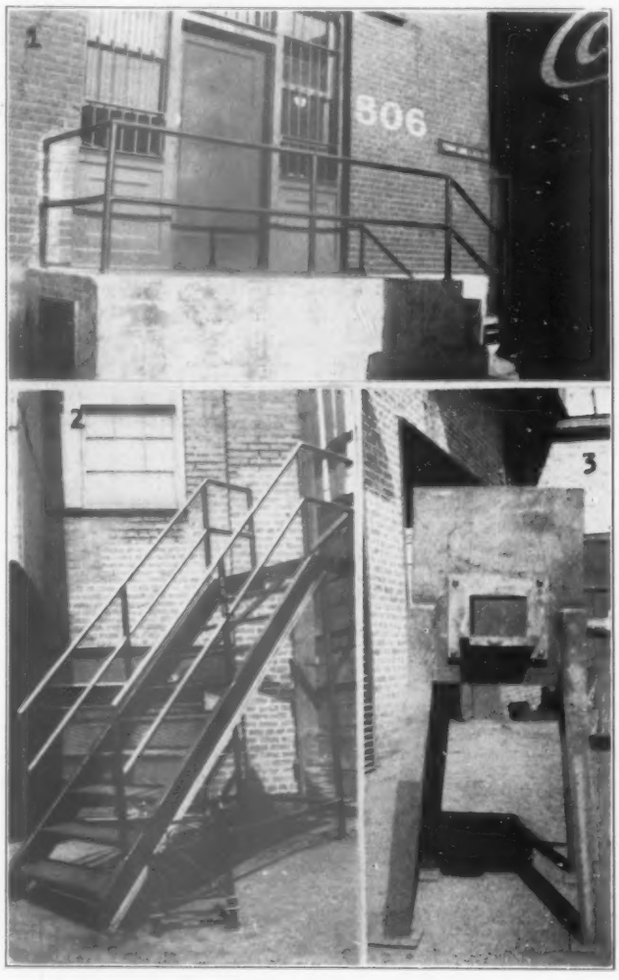
One 200-amp. machine is in general purpose service,

A Handful of Lintels.

possibly in the machine shop, building up worn down shafting which is machined afterwards to a finished diameter and put back into service; or, reclaiming worn tire moulds for auto tire manufacturers; or, this machine may be in the foundry where we are able to save many valuable castings by welding surface defects and grinding smooth; or, we load it into a truck and send it to other towns as far distant as 100 to 125 miles to weld a road-builder's broken down grading outfit or swinging rig for a derrick.

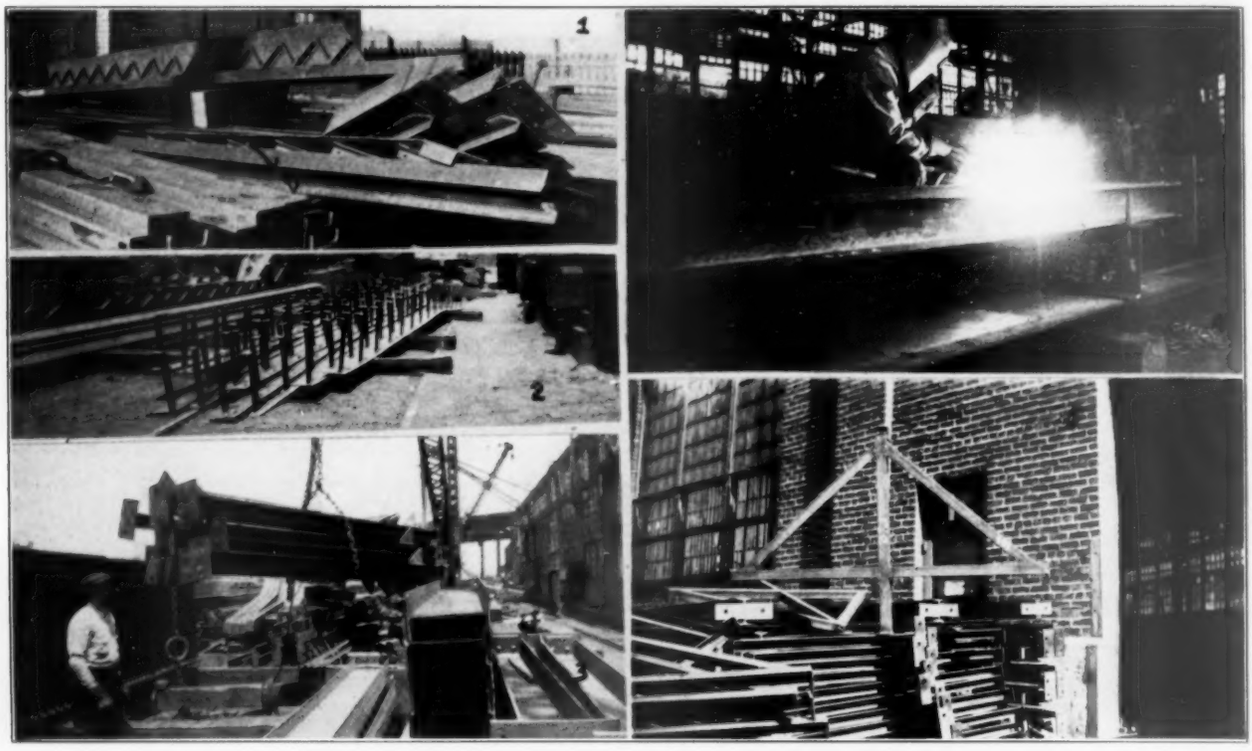
*Sales Manager, Paxton & Vierling Iron Works, Omaha, Nebr.

One 200-amp. machine is permanently located in our ornamental shop for the welding of area gratings, window guards, pipe railings, ornamental railings, fire-escapes, stair work, etc. Formerly, we used many thousands of small rivets, cap screws and bolts, where now we only use dozens. We have practically discontinued using any elbows, tees, or crosses in making gas pipe railings, as we weld all connections. This is especially advantageous where railings are on slopes, as any bevel is easy to the torch and welder. Much material is also saved in making brackets for fire-escapes or stairs, by eliminating gusset plates.



(1) Welded Railing. (2) Welded Staircase and Railing. (3) The Rivet Heater.

The two 300-amp. machines are used in the structural steel shop where we handle heavier materials and greater penetration is required. In this shop, our welding is principally two angle lintels back to back, column base plates and connections to the columns for beam and truss attachments; also flange plates to the bottoms of spandrel beams or channels for the support of masonry. One of the interesting indications of welding to us as manufacturers is the way the men in the plant make use of it for plant purposes. If a line of shafting is to be strung along a row of columns,



(1) Stringers for 12 Sets of Stairs. (2) Strap Anchors Welded to Curb Plates. (3) Welded Columns and Braces. (4) Welding Base Plates on a Row of Columns. (5) Welded Stair Brackets.

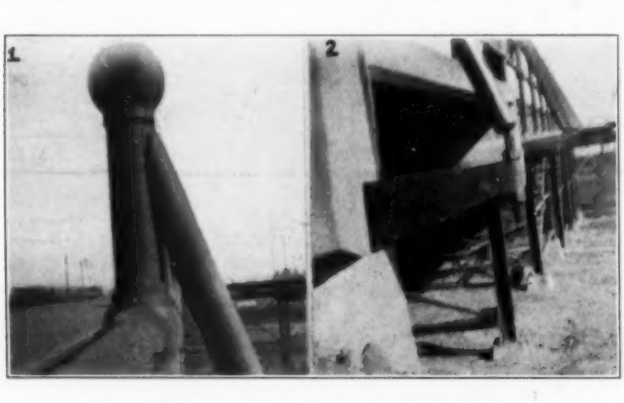
we cut off short pieces of I-beam and weld these to the flanges of columns or weld hangers to the under side of floor beams.

We recently made a rivet heating furnace for ourselves. This was made up in the form of a box with the corners welded and angle legs welded on for support, as shown in one of the illustrations.

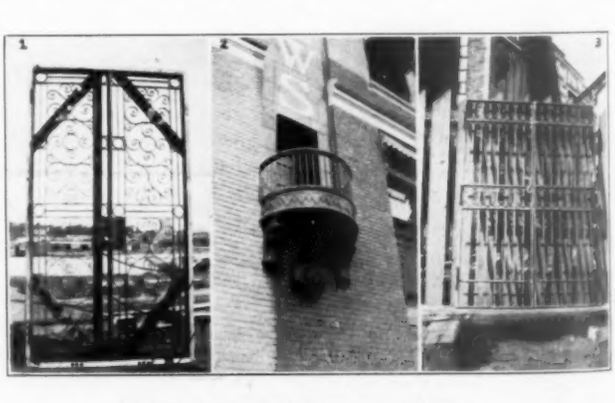
Two very good examples of savings of money will illustrate. One illustration is entitled "A Handful of Lintels." This shows a pile of I-beam lintels with plates welded to the bottom full length. Had these been riveted with the end one foot or so countersunk, the sequence of operations would have been: prepare a shop drawing and blue prints; cut the beam and plate; mark beam and plate; send the beam through the punch; send the plate through the punch and then to the drill press for countersinking; assemble the plate on to the beam with drift pins and bolts; drive the round head rivets; send back through the riveter for driving the countersunk head rivets.

Now, if the beam and plate are welded, note the few, simple operations. Prepare shop drawing and blueprint. The spacing of the welds is easily determined from tables of equivalent weld strips for each different size of rod and rivet. The beam and plate are cut to length, then assembled by the welder on a table; the plate clamped to the beam, then welded. Moreover, both the architect and contractor are more than pleased because of the smooth under surface of the plate which has no protruding rivet heads to interfere with door or window frames, or to form unsightly wide mortar joints.

Another illustration is composed of two pictures, one of the top connection and one of the bottom connection of a pipe brace to a pipe railing. This railing has 110 posts and braces. We estimate that we made a saving of $1.50 per fitting omitted, or $3.00 per brace, by using the welding shown instead of the special fittings originally designed. The bottom brace is made by welding a plug in the end of the pipe with a bolt set in which extends out and down through a knee brace from the floor system of the viaduct.



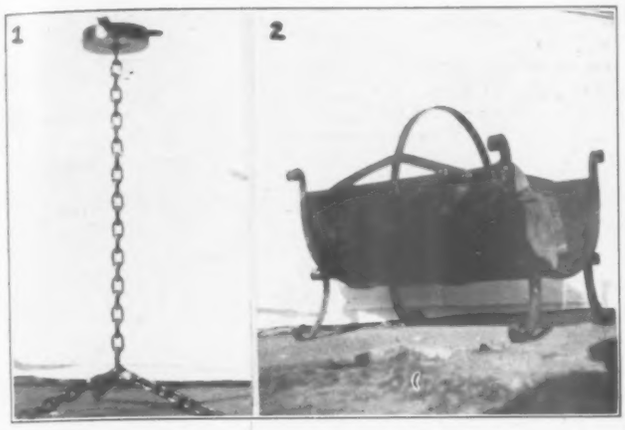
Top and Bottom of Pipe Brace for a Pipe Railing.



Welded Ornamental Gates and Balcony.

Many welded novelty articles can also be made. Two are shown which we have made to give away for advertising purposes at such places as manufacturers' dinners, noon

day luncheon clubs, etc. One is a welded smoking stand which is made of chain and one is a wood basket of welded



(1) Ash Tray of Welded Chain. (2) Wooden Basket, Hammered and Welded.

and hand hammered construction. These are painted with a clear varnish and gilt powder is dusted into the wet varnish.

There are also several pictures of ornamental railings all welded, and stair work with pipe railings. The structural shop equipped for welding can fabricate all manner of doors, balconies, railings, fences, etc., to order. Valuable experience in design and procedure is gained from some of this smaller work and comes in handy when planning larger welded constructions.

USE OF WELDING IN HOSPITALS

Most British public hospitals maintain their own repair and equipment workshops and plumbing and coppersmiths' shops, and today there is an increasing tendency to realize the importance of oxy-acetylene welding plant as part of such equipment. Those hospitals which have installed them are using them for both repairs and production—repairs and maintenance work in connection with the large number of pipe lines which every hospital possesses, on the upkeep of laundry machinery, and the lathes and drilling machines in the workshops, in addition to production work in pipeline extension for heating plant.

But more interesting, perhaps, than these ordinary practices is the increasing use of the process in the manufacture of surgical and general hospital appliances; and although this work is done by artificial-limb or surgical-instrument manufacturers, it is frequently found that a large hospital is equipped with workshop and appliances to do such work on the spot. Metal splints, for instance, must be made up in the workshop, often to be ready within an hour or two, and made to certain exact measurements in each case. It is unlikely that a patient will be a "stock size" in splints! Indeed, "stock sizes" are unknown, and every splint is made individually to suit each case. By designing for oxy-acetylene welding, grooved metal with set screws and brazed or screwed joints is eliminated, and a much lighter instrument of greater strength is constructed by welding metal bar, tube, and strip cut or bent to exact measurements. Hospital splints are made of steel, duralumin or aluminum, all of which can be welded—though with certain reservations and safeguards as to strength in the case of duralumin.

In one hospital, patients' stretcher trolleys are now made as completely welded structures of mild-steel tube, nickel-plated on completion. These welded frames are lighter and stronger than those previously made with brazed or screwed joints, and all rattle and vibration are prevented. Such trolleys have no crevices or cracks to hold dirt, with the exception of the ball race junctions near the ground, and are very easily cleaned; moreover, they are less expensive to make than other kinds.

Saline bowls, surgical-instrument trolleys, metal chairs for operating theaters, dishes, swab-bowls, and numerous other hospital requisites are now made by means of the blowpipe, while repairs to surgical instruments, such as forceps, many of them highly expensive to buy, are made quickly and economically. Dental mechanics also use the oxy-acetylene welding process in the making of artificial teeth.—From the Report of the British Acetylene Association to the Xth International Congress, held at Zurich, Switzerland, July 9-12, 1930, on the Progress of Oxy-Acetylene Welding and Cutting in the British Empire.

WELDED FILLING STATION TO SERVE CRAFT AT SEA

The first marine floating service station of welded construction, was launched on August 5th, at Elizabethport, N. J., by its owners, the Richfield Oil Corp. of New York.

This all-welded "filling station" was built by the Truss-Weld Barge Co., New York, employing the truss-weld system developed by Johs. Kjekstad. The application of this system has been fully described in previous issues of

The All-Welded Floating Filling Station.

The Welding Engineer. This station is the first of a fleet which, according to present plans, will serve the entire coast from Maine to Florida.

The illustration shows the craft, following its launching down the runways of the Sullivan Shipbuilding Co., Elizabethport, N. J., where it was constructed. Aboard is the launching party headed by A. C. Woodman, president of the Richfield Oil Co. of New York; included are prominent figures in marine and aeronautical circles, officials of the company, and newspaper and magazine writers.

The station, developed by Richfield engineers in conjunction with Kindland and Drake, naval architects, includes many features for which letters of patent have been granted. All tanks have been placed below deck, and have a capacity of 30,000 gal. of gasoline and lubricating oils. The craft measures 50 by 30 ft. Special attention was given the servicing facilities for aircraft as well as seacraft, the station being equipped with a bumper at one end for the safe tie-up of pontoon planes. The vessel is easily discerned from the air by its distinctive marking of blue and cream checks, and will be illuminated at night.

The service station, carrying a service crew of eight in addition to its manager, George H. Mohr, will be anchored at Red Bank during the Gold Cup races, and at New London during the International yacht races.

Welding News *told by Pictures*

The Engineers Society of Milwaukee, Wis., ceased their inspection of this arc-welded building long enough to face the camera. The building is the new $1,700,000 Central Engineering building at the East Pittsburgh, Pa., works of the Westinghouse Electric & Manufacturing Co., and is reputed to be the largest arc-welded building in the world.

All cracks and joints disappear as the masked welder casts his magic spell over the steel. This is an application of atomic-hydrogen welding in the joining of two parts of a Maytag washer tub to form a leakless whole.

Desilverizing kettle, entirely arc-welded, for the American Smelting & Refining Co., of Omaha, Nebr. Formerly made of cast iron, these kettles were first built of steel two years ago. The welded steel kettle stands 400 heats, while the cast-iron one must be discarded at the end of 100 heats.

A welded hydroelectric penstock dips down under a stone arch and into a valley of rustic beauty. The scene is Murgwerk, Germany. This penstock is subjected to an internal static head of 500 ft., and its joints have been welded by water gas, the use of which is quite common in some parts of Europe for welding operations.

Selecting and Supervising Welders

"Every Weld a Good Weld," Is a Slogan Not Impossible to Realize Where Each Welder Is Selected With Care and His Work Periodically Tested

FIFTY-FIVE HUNDRED welds in ten cracking units without a single break or leak! Such is the claim made by the East Chicago, Ind., refinery of the Empire Oil & Refining Co. B. H. Leonard, chief supervisor of welding, credits this remarkable showing to the method of hiring and supervising welders. Those who claim that a good welder today may be a poor welder tomorrow, if it happens to be his "off day," and that none will be any the wiser, may profit from the story of how this refinery chooses capable welders, how they help them to make good welds, and how they keep a continual check on them to see that they do good work.

Testing Men Who Apply as Welders

When a new construction program at this refinery required building up the welding force, men were obtained through advertisements inserted in the classified columns of newspapers, which gave the location of the refinery and stated whether oxy-acetylene or arc welders were wanted. This was productive of bringing in many men, who first were questioned as to their experience, and if the replies warranted further consideration they underwent a test for the particular type of welding for which they claimed preference. Whenever both gas and arc welders are needed, the applicant is allowed to take a test for whichever type of welding he prefers. This test consists of the overhead welding of the underside of a butt seam in a pipe in the welding shop on the refinery grounds. The applicant's work is carefully watched by the shop foreman for dripping, penetration, and general appearance, including reinforcement. The reinforcement is required to be at least $\frac{1}{16}$ in. high on all pipe up to 6-in. size, and $\frac{1}{4}$ in. high for larger pipe. Under no circumstances are welds allowed to be "rivered" or grooved along the edges. A full rolling weld is required.

If the applicant passes the test, he is immediately hired. If he fails, he is automatically eliminated and given no further consideration, except to have explained to him why the weld was not satisfactory. Some welders are hired only for the welding of cast-iron pipe, in which case the tests are carried out on this kind of pipe.

This method of hiring was the means of obtaining some satisfactory welders, although these were a very small fraction of the total number undertaking the tests. During some days as many as 25 or more underwent the tests, and perhaps only one or two out of this number were accepted, and in many cases none of them passed the tests satisfactorily. The company gives no welding instruction, and employs only those men who they are convinced know how to weld and weld right. The men are not allowed to use just any technique or method of welding they desire. Very rigid rules are laid down to all welders; and the amount of oxygen, the gas pressure, and the size of tip to be used is designated by the supervisor. For each job of arc welding, the amperage, voltage, and size of electrode are specified. All welds are required to show solidity, penetration, uniformity, and those other qualities of strength. Almost all the welding done at this refinery is pipe welding, but good penetration must be secured and at the same time the drip through to the inside must be held to the very minimum as it increases the resistance to the flow of the liquid or gas in the pipe. Although overhead welding of pipe actually is a small part of the total welding that the successful applicant will be put to doing, it was considered that the man who can make a successful overhead weld, which is the most difficult position weld, will be able to make good welds in all other positions.

Keeping New Men Under Observation

After a man is hired, he is kept in the shop for several days making welds on such equipment as is assembled there. In the shop he is kept under continual observation and is given every assistance possible to make good. His first real job is a pipe butt weld. After completion, it is taken away, unknown to the welder, and tested for strength and examined for penetration. Two test coupons are used, one cut from the top of the pipe and the other from the bottom, thus representing flat welding and overhead welding. If these tests are satisfactory, more assurance is placed in the welder's work.

After several days in the shop, the welder is sent out to do field work, but throughout the time of his employment tests are made at frequent intervals, always without the previous knowledge of the welder. This is accomplished by cutting out a small section of pipe containing the weld, which requires the ends to be butted together again and rewelded. Intervals between tests of each welder's work are never greater than three days, and sometimes such tests may be taken only one day apart, depending on circumstances. Frequent tests are taken if there is the slightest reason for suspecting the welder's work.

Testing Specimens of Welders' Work

In making these tests, it is required that every specimen break outside the weld. Should a specimen break in the weld, two more tests are taken of the welder's work. It is required that two out of three of these welds must hold; that is, the last two specimens must break outside the weld. If this requirement is not met, the welder is forthwith discharged, with an explanation of why such action is taken.

The company is not satisfied if their welders make good welds only on certain days and working under certain conditions, but demands that their work be reliable day after day. Poor welds cannot be countenanced, as a leak or fracture may require a complete shutting down of very costly equipment for several days until the pipe can be purged of oil or other combustibles and rewelded.

Every consideration is given the welder to make him do good work. His foreman sees that he is supplied with the proper equipment on the job, that the parts to be welded are properly made up for welding, and that the welder understands just what is to be done.

Each applicant who is accepted for a welding job is given preliminary instructions and cautions, something along this line:

"We're putting up a refinery here, and we want the best work you can give. We won't crowd you or hurry you along, and we expect every weld to be good; if it isn't, we don't want you. We will give you every opportunity to make good here and assist you to do good work. But in return we expect the best that is in you."

In selecting welders from a host of applicants, the welding supervisor never deviates from the rule not to employ a man who has worked for him before; for such a man either was discharged for a fracture of rules or quit volun-

tarily, so he already carries the stamp of being unreliable, even though otherwise he may be a good welder.

During the time that welders are being advertised for, each man who passes the test is retained until a place can be made for him, if such an opening does not already exist. Once a man is hired, it is extremely seldom that he must be discharged because of a failure to do good work. Such discharges as occur almost invariably are a result of drunkenness, frequent absence from work, or other conditions that employers would not tolerate.

Experienced vs. Inexperienced Men as Cutters

In addition to a large force of welders, there are employed at this refinery a considerable number of men who do nothing but cutting with the torch. It is the policy of the welding department, however, never to hire cutters, but to train men for that work. The men who are selected for cutters are put on the job in the field with welders, and receive most all their training in the field. The reason for this policy is that men whose only experience with cutting has been in refinery work will be more apt to respect the rules of safety that must be followed than will cutters who have been used to cutting into scrap metal without having to think about the possibility of danger resulting from such cutting. A cutting torch applied to the wrong pipe or used at the wrong time may kill or maim many persons and result in property damage running up into the hundreds of thousands of dollars. A high degree of precaution is necessary with the welding torch, although almost all such work is done on new construction, but such precaution is even more important in the case of cutting, and the cutter must "know his pipes," so to speak.

Safeguarding the Workmen

To eliminate as much as possible the element of danger in welding and cutting about a refinery, all work of this nature done outside the welding shop or its immediate vicinity requires a permit for each man on the job. Any one lighting a welding or cutting torch or starting a welding machine on the refinery grounds, outside the welding shop, without having with him a written permit, is summarily dismissed as a dangerous person.

The welding personnel at this refinery is headed by a welding supervisor, who is responsible for the men, materials, and the work. Under him are a number of foremen —always men of many years' experience in welding. The number of men under each foreman varies a great deal with the ups and downs of employment, with the character of work being done, and with the territory covered. Ordinarily a foreman can give good supervision over 12 or 13 men. In some cases a foreman may handle twice this number, and if the work is spread out over a considerable area perhaps 5 or 6 men will be all he can handle.

There are certain details of preparing work for welding and making the weld that have been standardized as being best parctice at this refinery and which the workmen are required to observe.

Preparing Material for Welding

All material is cleaned by sandblasting before welding; and all welding is done upgrade, none downgrade. In butting pipe for welding, particular care is taken to see that the clearance between the ends is sufficient so the torch will burn clear to the bottom of the seam, as it is only in this way that full penetration can be obtained.

To hold the pipe in position for arc welding, it has been found that the tacks must not be more than 2½ in. apart. A greater distance can be used in gas welding.

In making saddle and butt welds with the arc, the metal is applied in three layers. First is the pressure bead; if this has been laid properly, it will resemble a large welding wire split in two and one of the halves laid around the seam near its bottom. Then follows the fillet weld; and over this is laid the third layer, which is the reinforcement. Each layer is scaled with an air gun and roughing tool before the next layer is applied.

Each welder is required to mark his welds with his designated letter. Formerly punch dies were used for this purpose, but because of breakage and loss of the dies the men now use chisels with, it is claimed, a saving in time. The welder chisels out his mark alongside each weld. There are two reasons for this: In the first place, should there be any cause to question the soundness of a weld, the mark identifies the man who made it and his work can be checked by tests, as previously explained. Also, whenever a welder is discharged because of poor work, all welds made by him are destroyed, except those welds made during such periods as tests showed that he was doing satisfactory work. Hence these marks are the means for identifying the doubtful welds. A permanent record is kept of all the tests that are taken from time to time, as has already been mentioned. By means of this record, and the continual checking of each man by testing his work, and his initialing of each weld, a reliable system is built up for insuring good welded construction all the time.

Supplying Equipment for the Welding Job

Each welder is supplied with welding wire for the particular job he is on; he has no choice in the matter of wire selection. Experience has demonstrated beforehand what wire is best suited for the particular pipe or other equipment that is to be welded, and this wire is supplied for the job. In some cases pipe specifications read that the pipe, in addition to meeting other requirements, must be weldable by such-and-such a rod. This adds further assurance to receiving pipe of uniform quality.

All cast-iron pipe is annealed after welding, this being done by bringing it barely up to a red heat in a furnace of special construction, and allowing it to cool gradually.

The experience of this refinery indicates beyond a doubt that it is possible, even on big-scale operations, to insure that every weld made is made right. Since starting operations in August, 1929, a failure in a weld is yet to be reported.

AUSTRALIAN WELDING INSTITUTE ISSUES LIST OF PROBLEMS FOR DISCUSSION

Some of the recent monthly meetings of the Australian Welding Institute have been devoted largely to the discussion of problems submitted to the membership in the Institute's letter prior to the meeting night. At the meeting held in Melbourne on June 26th, the following questions were taken up:

(1) What is the correct procedure for welding 12-gage boiler tubes to a ½-in. tube plate? (2) In reinforcing a channel section by welding a plate along the inside of the flange, how would distortion be avoided? (3) What is the correct procedure for making repairs on boilers, as described on page 149, May issue of "Mechanical and Welding Engineer"? (4) What are the internal stresses in a weld during cooling? (5) What is the correct procedure for making a longitudinal weld on a ⅜-in. mild-steel plate by the oxy-acetylene process? (6) Is the rate of gas cutting proportional to the amount of oxygen flowing through the cutting jet?

At the luncheon of the Institute held on June 18th, the speaker was J. Hume Cook, of the Australian Industries Protection League.

Hints for the Welder

WHEN YOU FIND a new way to do a hard job, or finish a particularly interesting weld, can you describe how the work was done? . . . . . Have you learned some little stunt every welder ought to know? . . . . . Write to us about these things . . . . . This department helps you welders to help each other. Write up your ideas any old way and just make rough pencil sketches . . . . We'll fix them up for publication.

LARGE ROCK CRUSHER CASTING IS WELDED

One of the largest cast iron welding jobs ever attempted on the Pacific Coast was recently completed at Roscoe, California, by the Paulus Welding Works of Los Angeles. The job, which was done entirely by the oxy-acetylene process, comprised the welding of a fifty-five ton casting, being the main bowl of a 28x36-inch Traylor Bulldog Jaw rock crusher, and was done for the Edwards-Wilde-Dixon Company of Los Angeles.

The thickness of the casting ranged from two to three and one-half inches. It was badly cracked and broken in fourteen pieces. The cracks and pieces were prepared for welding by V-ing to forty-five degree angles with the oxy-acetylene cutting torch. Width of the welds when completed ranged from three to six inches. The total length of welding for the completed work amounted to about ninety feet. The accompanying photographs illustrate the comparative size of the casting, together with the size and width of the welds. Pre-heating was done by charcoal.

(Left to Right) Beveling With the Torch. Ready for the Welder. A Few of the Welds. The Completed Job.

This job required approximately four weeks, and consumed twenty-four thousand feet of oxygen, and ten thousand feet of acetylene. Nine hundred pounds of Oxweld No. 10 bronze and one hundred pounds of Oxweld No. 1 High Test steel was used in the work.

Several thousands of dollars were saved by the successful welding of this unusually large casting. The casting is now in operation and giving perfect satisfaction. Much credit is due those whose efforts were successful in accomplishing this unusually heavy job.

REPAIR OF SUBMERGED CAST-IRON PIPE LINES

By L. F. Hagglund
Manager, Under-Water Metal Cutting Corp.

The City of Bayonne, N. J., receives its water supply through two 36-in. cast-iron pipe lines which cross under the Hackensack River a hundred yards south of the Lincoln Highway bridge. During the past summer a contract was let to lower these two pipe lines to permit deepening the river channel. The work of lowering these lines started in the early summer, the contractor using a hydraulic dredge to dig a trench under each pipe line while the line was suspended from platforms supported by two rows of wooden piles driven one on each side of the line. By means of lowering winches on these platforms, sections of pipe were lowered to the new level as the dredging was completed.

Shortly after the start of the work the dredge accidentally dropped one of the anchoring spuds onto a section of the pipe. The spud cracked the section and the action in the water gave evidence that a considerable quantity of water was escaping from the pipe.

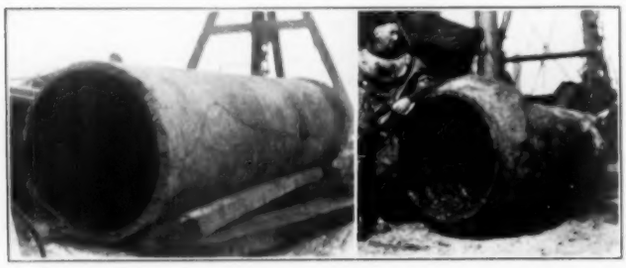
The Bayonne City authorities immediately closed down the damaged line so that repairs could be made. An examination by a diver disclosed the fact that one section of pipe had been cracked over 80% of its entire length, necessitating that the section be removed and replaced with a new section.

The removal of the damaged section alone from the line presented a serious problem. Recourse was made to a tool

that had been used by the City of New York to meet a similar emergency in the repair of the Narrows Syphon which furnishes the Staten Island Water Supply. This tool was the electric submarine torch, which may be used to cut any metal under water at any divable depth. A complete under-water metal-cutting outfit was obtained, together with a skilled diver operator, and the work of removing the damaged section started.

A cut was made around the pipe in two places, and the damaged section with the bell of the adjacent section was removed. The thickness of the cast iron cut varied from 1.58 in. to 3.5 in. at the bell. This work was done in a strong river current and at a depth of 30 ft. below the surface.

A new section of pipe, together with a sleeve, was then



Section of Pipe Cut Out and Bell Which Also Had to Be Removed.

obtained and made up on the deck of a scow. While this work was being done the diver went down again and with the aid of the electric torch cut clear the bell, which was still secured with its lead packing onto the spigot of the outshore line. This was the most difficult part of the under-water cutting operation. The bell varies in thickness from 1.58 to 3.5 in., and at the mouth is encased in a steel band 1 in. thick and 2 in. wide. To split this bell in half to remove it required two cuts made through steel and cast iron 4.5 in. thick. These cuts were successfully made and the bell removed.

A new section, together with a sleeve, was then put down, the joints caulked by the diver under water, and the line was once more in service.

VARIETY OF TOOLS MADE BY WELDING

A number of tools for use in structural-iron work and for other purposes have been made in the shop of F. Lemieux, at 410 S. Laflin St., Chicago, Ill., by arc welding together such miscellaneous pieces as nuts, tubing, and rolled stock cut to size.

In Fig. 1, *A* is a hydraulic test pump that had to be built hurriedly to carry out a test on a certain piece of equipment. The pieces making up this pump were prepared and welded together and the entire assembly completed in about three hours—a much shorter time than a pump answering the purpose could have been obtained from a manufacturer or dealer.

B is an air jam for holding rivets in structural work. One of the features of this particular tool is that it can be used in a space of about 3½ in. Fig. 2 illustrates the construction of this device. It was built of a ⅝-in. length of round steel welded to one of the ends of a 3-in. tube 2⅜ in. long. A ⅜-in. pipe 3½ in. long was welded at one end to one of the sides of a square rod 2⅜ in. long. The square rod was then welded to the side of the 3-in. tube. Four holes were then drilled to connect the inside of the ⅜-in. pipe with the cylinder formed by the 3-in. tube. It was then necessary to use the welding arc to close up the ends of two of the holes made by drilling. This completed the device. When the coupling of the air hose is attached to the end of the ⅜-in. pipe, the air is conveyed to the interior of the cylinder through the series of holes made by drilling.

A novel pair of rivet tongs is shown at *C* in Fig. 1, and one of the halves of these tongs is illustrated in Fig. 3. The handles and the pieces supporting the grippers are welded to hexagonal nuts, through which a pin passes, forming the fulcrum. The tong ends, or grippers, consist of a

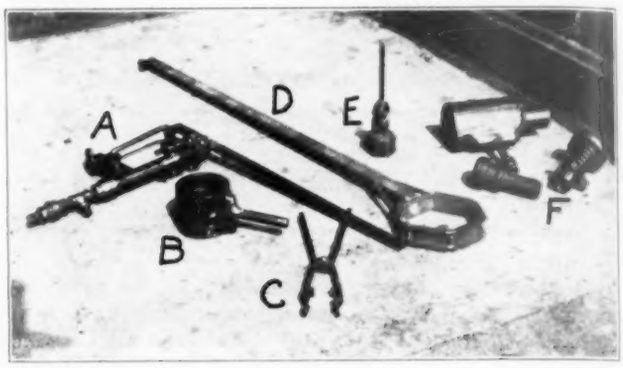


Fig. 1. Group of Welded Tools.

small piece of ⅜-in. pipe welded at one end to the side of a short piece of 1-in. pipe, and then split along the axis of the ⅜-in. pipe, thus forming two identical halves.

D is a wrench for a large hexagonal nut, formed by welding together six short pieces of light channel section to form a hexagon, and then welding on a handle and two pieces of rod for braces.

A socket wrench made by welding small flat pieces to form a hexagonal-shaped cup and welding on the top of it two nuts at right angles to each other, is shown as *E* in Fig. 1. The lever with which to turn the wrench is passed through the hole of either nut.

F is another air jam, showing all the parts. In this case a semi-circular section of pipe, made by sawing a short length of pipe in half, was substituted for the small length

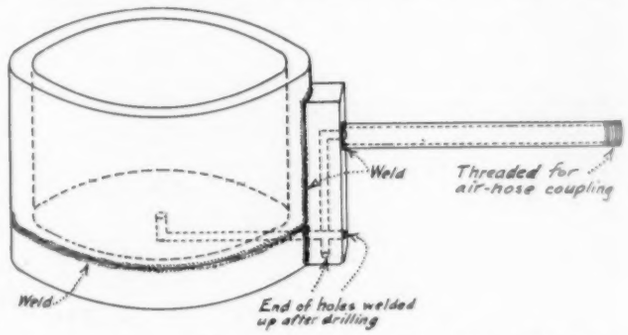


Fig. 2. Diagram of Welded Air Jam, Showing Where Holes Were Drilled.

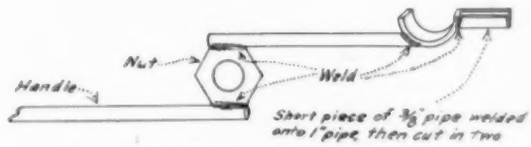


Fig. 3. Showing Construction of Welded Tongs.

of square rod used in air jam *B*, thus doing away with one of the drilling operations.

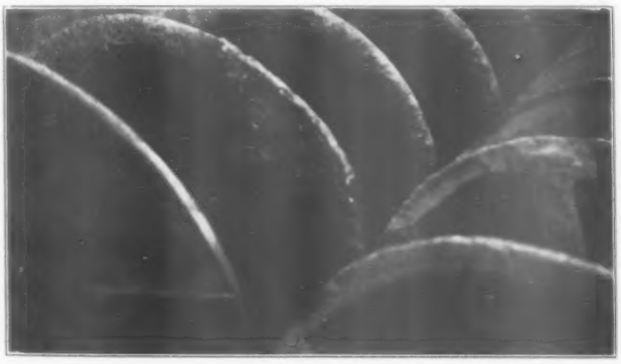
The accurate setting of a foundation shoe in a well is often a troublesome operation. Mr. Lemieux uses a method by which he claims he can make an accurate shoe setting in no greater time than 20 minutes. He welds on three nuts, spaced evenly around the circumference of the shoe, inserts threaded bolts through the nuts, and turns the bolts to adjust for flatness and height.

HARD FACING JOB MAKES BIG SAVINGS

An illustration of how important hard-surfacing operations can be in a large industrial plant is found in a job recently completed by the Flour City Oxwelding Co., Minneapolis, Minn. The work consisted of hard-surfacing the edges of two screw conveyors for one of the local industrial plants. The complete contract involved about 91 lineal feet of hard surfacing 1 in. wide. The material used was Hascrome. It was applied by means of the electric arc, and 62 lb. was required on each conveyor. The value

General View of Reclaimed Conveyor Blades.

of hard surfacing in this case lay in the fact that it made it possible to get at least three times the service out of each set. In other words, it means a much less frequent shutting down of the plant for the purpose of replacement. When a set of these screw conveyors is replaced, it means



Close-Up View of Conveyors, Showing Layers of Hascrome.

three days' time with a crew of four men at a labor cost of about $75. On top of this, there is the cost of lost time in the plant, which runs well into three figures each time replacement is necessary. To this must be added the fact that the cost of a new set of screw conveyors is around $250.

PROFITABLE WORK FOR SLACK SEASONS

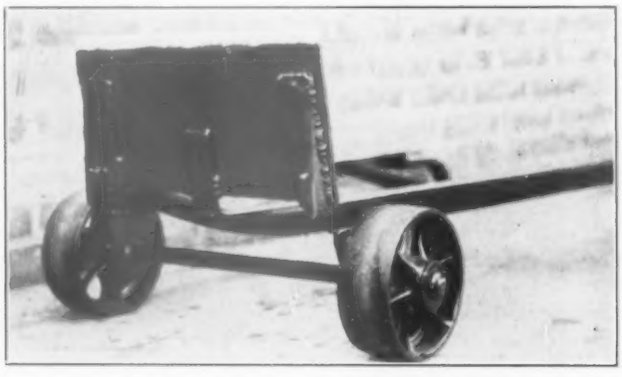
During the slack periods between the busy welding seasons, the most progressive job welders look about for additional sources of income. One welding company in the southeast has hit upon a scheme which has proved quite lucrative; and at times when other welders are doing very little business, this shop keeps its own crew profitably employed. This is the Aldrich Welding Works in Anderson, South Carolina. The illustrations show various types of welded metal furniture which is being fabricated in the shop. It is so attractive and unusual that it has brought forth considerable comment from the people in the vicinity. H. E. Aldrich, the proprietor, finds that this is not only a profitable line but also serves to make the people in his vicinity aware that he is in business and is capable of turning out excellent work. The Tom Thumb golf course craze is in full swing in this section of the country, and he takes advantage of this by placing several

What the Welder Can Do With Stock Shapes of Steel and Iron.

pieces of his welded furniture at the courses in his city. The result is that he has a silent and effective salesman pulling for him all the time. This is a plan of action which might well be followed by many other job welders, because metal furniture of this kind is becoming more and more popular for summer use on account of its durability, and because of the opportunities for making up special designs with a negligible increase in cost.

PREVENTING ABRASIVE WEAR ON HAND TRUCKS

The manufacturer of the hand truck shown in the accompanying illustration has standardized on the use of an



Here Hard-Surfacing Is Part of the Manufacturing Process.

abrasive-resistant for the wearing edge of the steel plate. The hard surfacing of the nose of this truck is a part of the regular production process and is done to insure longer life to the product and greater satisfaction to users.

A band of Haynes Stellite about ¾ in. wide is applied along the entire under side of the front edge of the steel plate, 14 in. wide, which forms the bottom of the truck. The abrasive resistant is applied to a thickness of about ½ in. by means of an oxy-acetylene welding blowpipe. The steel plate rests on three supports, to which it is secured by means of oxy-acetylene fillet welds. By the use of welding and Haynes Stelliting, the manufacturer has obtained for his product the greatest possible strength coupled with resistance to abrasive wear.

Manufacturers who are not equipped to apply hard-surfacing materials will be interested in knowing that Haynes Stellite can be applied by any contract welding shop.

IF YOU MUST DRINK ICE WATER PUT OATS IN IT

This is the time of year when the welder should beware of drinking ice water, particularly if he is on a "cooking" job. The heat from preheated castings and other objects is not readily dissipated in warm weather, and the welder who is working over such objects is liable to resort to drinking ice-cold water to relieve his discomfort. This may result in excruciating stomach pains and perhaps prostration. The best plan is to leave ice water entirely alone. But if ice water is insisted upon, dash in it a bit of oat meal before drinking. Although the taste at first will seem slightly disagreeable, it will obviate any detrimental effects that might result from drinking the water without such treatment.

EVERYBODY'S BUSINESS

(*Concluded from page* 23)

against frozen foods, and properly so. A piece of frozen meat was about as tasteless as ginger ale that had been standing overnight in an uncorked bottle. Then came a new vision. It was proved that the use of cold as a method of keeping foods fresh was all right, but we didn't use enough of the cold. Studies disclosed that it was wrong to freeze foods slowly at comparatively high temperatures.

Research has proved that when foods are frozen quickly at temperatures far below zero—50 deg. below is now used, they can be thawed out later and cooked without loss of their original color and flavor. These congealed foods afterward must be kept constantly at a temperature about 20 deg. below the freezing point.

The rapid spread of the idea of quick-frozen foods represents an astonishing business romance. It is an achievement that makes possible the preserving and storing of foods in times of plenty against times of scarcity. It reduces waste in distribution by making it possible to ship from the point of production only the edible portions of meats, fish, and other products. It permits the work of 12 hours to be done in one hour. Ice cream is as much hardened by this method in 50 minutes as it is in 10 hours or more by the older process.

So startling is this new conception of food handling that business leaders do not yet know what the outcome will be. Probably all of our meats will be handled in consumer packages, ready for cooking. We will buy fresh vegetables as we now buy trade-marked brands of coffee and crackers. Milk, cream and butter will be held over from months of peak production to months of scarcity, thereby flattening out the price curve. In case of necessity, a large part of any bumper crop, such as strawberries, may be held over for a year or more, in this way preventing the producer from being hit below the belt. Possibly the citrus-fruit growers will now be able to market the juice of millions of oranges that are too small to sell at a profit.

Quick-freezing at sub-zero temperatures not only hastens production in the ice-cream industry, but results in smaller ice crystals, thereby giving the ice cream a finer texture. The use of fresh-frozen fruit will soon be taking the place of canned fruit, improving the flavor, and the use of better grades of powdered milk will increase the solids in the finished product. Through the employment of dry ice, which produces a temperature as low as 114 deg. below zero, markets are being extended and deliveries facilitated. All of this means much to a great industry distributing 275,000,000 gal. of a single product that has an annual retail value of about $350,000,000.

Although I have hardly scratched the surface of what is taking place around us, I hope I have lent substance to the belief that the future of life and business in the United States is bright with hope. The engineering and chemical advances of the next ten years will astonish the world. The time to buy and build is when business is bad, times are hard, earnings are unsatisfactory, and industrial discouragement is wide-spread.

REPORT ON INVESTIGATIONS OF WELDED AIRCRAFT JOINTS

The National Advisory Committee for Aeronautics recently published report No. 48 on the "Strength of Welded Joints in Tubular Members for Aircraft" by L. H. Whittemore and W. C. Brueggman. The investigation covered by the report was made by the Bureau of Standards in cooperation with the National Advisory Committee for Aeronautics for the Aeronautical Branch of the Department of Commerce. The object of the investigation was to make available to the aircraft industry authoritative information on the strength, weight, and cost of a number of different types of welded joints. Forty joints were welded under procedure specifications and tested to determine the strength of each joint. The weight and time required to fabricate were also measured for each joint. The report gives complete information regarding the physical properties of the materials welded and of the welding rod, detailed descriptions of the joints welded, and a complete outline of the procedure followed in making the welds and making the tests. Test results are illustrated by diagrams and photographs. Altogether the booklet contains information which will be very useful to all those who are interested in aircraft welding. It is obtainable from the Superintendent of Documents, Washington, D. C., at 30c per copy.

E. E. THUM WILL EDIT STEEL TREATERS MAGAZINE

Announcement has been received that E. E. Thum, who for the past three years has been Associate Editor of *Iron Age*, has resigned to become Editorial Director of the new magazine called *Metal Progress*, which will be published starting September 1st by the American Society for Steel Treating at Cleveland. The new magazine will take the place of the Journal previously published by the A. S. S. T. Mr. Thum is well known throughout the industry, having been for several years Technical Publicity Director of the Union Carbide and Carbon Corp., during which time he contributed many articles to the technical press on the subject of oxy-acetylene welding and was a frequent speaker before technical meetings on subjects pertaining to the uses of oxy-acetylene welding. His previous experience includes field engineering work and teaching of metallurgy, so that altogether he brings to his new position a rich background of experience in the field which will be covered by the new magazine.

LABORATORY MANIPULATION OF GASES FROM CYLINDERS

The development of a laboratory set of unit parts which greatly facilitate the manipulation of high-pressure gases from cylinders, has been announced by The Ohio Chemical & Manufacturing Co., 1177 Marquette St. N. E., Cleveland, Ohio. A folder is available describing these parts and their use in laboratory experiments and demonstrations. These parts follow the designs and specifications suggested by Prof. H. S. Booth, of the Morley Chemical Laboratory, Western Reserve University, in the June, 1930, issue of the *Journal of Chemical Education*.

The Ohio Chemical & Manufacturing Co. also announce that they can supply helium, hydrogen, oxygen, nitrogen, butane, methane, carbon dioxide, compressed air, and other common and rare gases.

NEW LIGHT-WEIGHT, WELDED STEEL TROLLEY BASE

Designed and constructed consistent with the present day demand for light-weight, better operation and low maintenance in electric railway equipment, a new light-weight, welded steel trolley base, Type US24-A, has been developed by the Westinghouse Electric and Manufacturing Company at its Nuttall Works.

Complete with a spring buffer, this new base weighs only 77 pounds.

This remarkable reduction of weight over the lightest of iron bases has been secured without the slightest sacrifice in strength, by the use of rolled steel for the base, heat-treated steel tubing for the pole socket and cast steel

Trolley Base of Welded Steel.

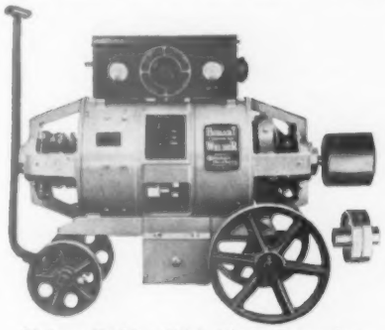
for the turret. Having lighter-weight moving parts permits quick action of the pole and allows the use of pressures of 25 to 35 pounds.

This new base embodies the same swivel arrangement as used in previous types of US bases. This main swivel pin is integral with the cast steel turret and carries two Timken bearings. The entire bearing assembly is encased in the cylindrical chamber welded to the rolled steel foot. Swivel bearings are protected from dirt and grit by a flanged construction on the turret casting. By loosening one bolt, the entire bearing assembly can be lifted out of the chamber. A lock nut on the end of the swivel pin permits adjustment of bearings.

SHAFT EXTENSION ON MOTOR-DRIVEN WELDER ALLOWS REMOTE DRIVE

The Hobart "Constant Arc" welder, with the "Unitrol" dial, can now be obtained with a shaft extension as optional equipment. This allows the use of a pulley attachment for belt drive or a flexible coupling for shaft drive. While this welder can be operated by electricity while in the shop, out in the field where suitable electric power may be unavailable it can be connected to a gasoline engine. Some shops are said to mount this outfit on a used automobile chassis, which they use as a trailer, connecting the engine to the welder by means of a direct coupling or by belting to the drive shaft.

This extended shaft allows the outfit to be used as an



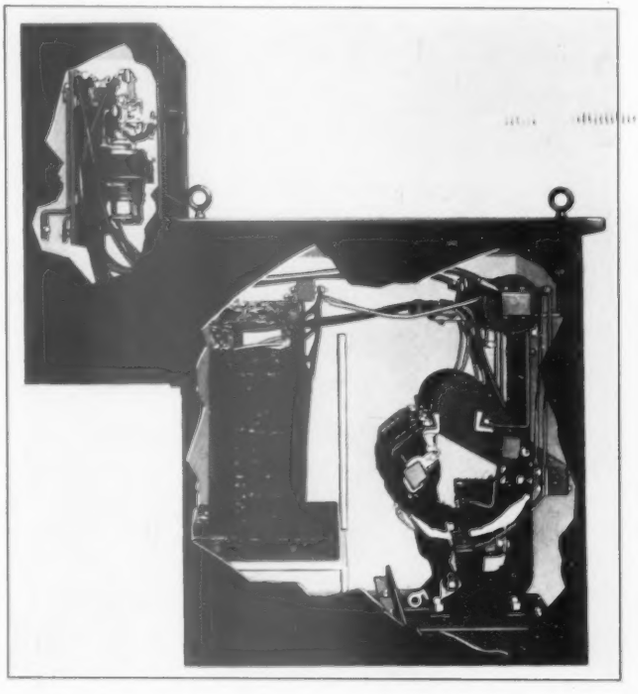
Hobart Welder With Shaft Extension.

electric motor when not in use for welding, for which purpose it is claimed to be efficient and economical.

Users of this equipment are cautioned that when using the shaft extension the power source must be equipped with a reliable governor to insure continuous operation at the correct speed of 1,750 r.p.m.

STARTER FOR LARGE-CAPACITY MOTORS HAS DUST-TIGHT WELDED CASE

A starter made in two sizes for alternating-current motors up to 600-hp. and 1,200-hp. ratings, respectively, has been designed by The Electric Controller & Mfg. Co., 2700 East 79th St., Cleveland, Ohio, with the unit totally oil-immersed, hence keeping all working parts well lubricated and protected from dust and corrosion. The welded case



The Working Parts of This Motor Starter Are Protected With a Welded Case.

not only serves as a seamless receptacle to hold the oil, but provides a flameproof and dustproof installation that may be mounted anywhere with perfect safety.

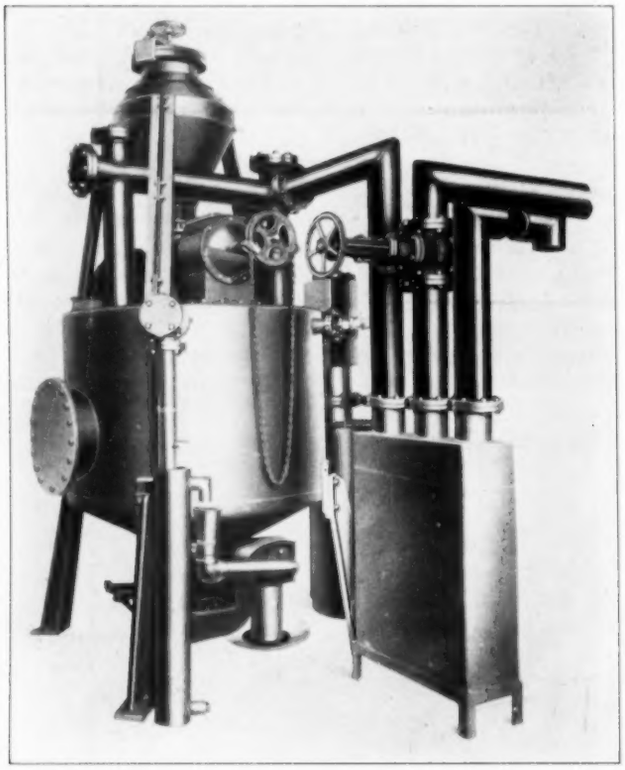
The starter is provided with overload relays and a self-contained transformer that produces 220 volts for the control circuit. It is designed for across-the-line starting of induction and synchronous motors operating at 2,300 volts. A longer tank than that shown, containing mechanically interlocked contactors, is supplied for reversing, non-reversing, and plugging applications.

TWO NEW ACETYLENE GENERATORS

The Oxweld Acetylene Co., 30 East 42nd St., New York, N. Y., has placed on the market two improved types of non-automatic stationary acetylene generators for supplying large volumes of acetylene. These generators are each made in two sizes, having 500 and 1,000 lb. carbide capacity, respectively. They are designed for large industrial plants where oxygen and acetylene are piped to stations convenient to operators.

The Oxweld Type NA-3 acetylene generator, shown in the illustration, is for plants using low-pressure welding and cutting apparatus, and delivers to a storage holder which is weighted to supply acetylene to the shop piping system at a pressure of 20 in. water column.

In operation, the carbide is conveyed from the hopper to the generating chamber by a rotary feed screw driven



New Oxweld Type-NA-3 Acetylene Generator.

by a slow-speed reciprocating water motor. The screw, being cast nickel, is very resistant to wear and will not cause sparks.

From the generator the gas enters the wash box, where it passes through a water seal, which acts as a scrubber to remove any particles of residue which might have been carried over. This device supplants the felt or hair filter usually employed. It has the advantage that it cannot clog and cause abnormal back pressure or insufficient delivery to the holder. It thus insures a constant generating pressure.

When residue is being drawn off from the generator the wash box acts as a vacuum release and permits a reverse flow of gas, which allows acetylene to return from the holder to the generating chamber to displace the drained water. When the generator is refilled with water, the gas passes from the generating chamber to the holder through this same wash box. The wash box is provided with an overflow which automatically limits the water level to give proper depth to the seal and to permit the functioning of the vacuum release during recharging.

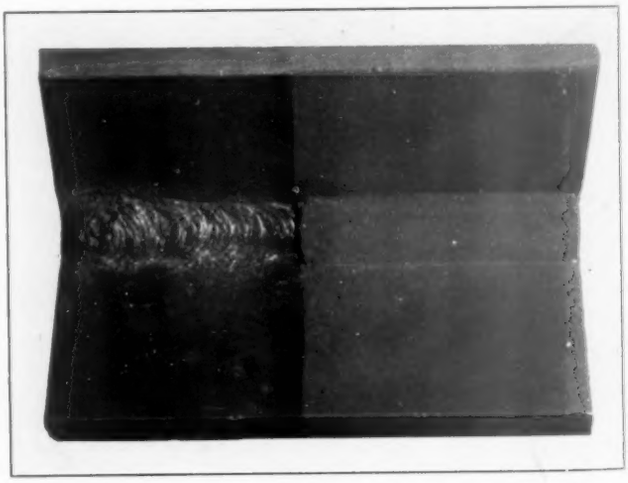
The gas holder of suitable size may be located either inside or outside the generator house as best meets the needs of the particular installation. On the holder is mounted an automatic water holder shut-off which stops the carbide-feed mechanism. When the gas bell approaches its upper limit, this shut-off must be opened by the attendant before the generator will again produce acetylene.

Except for the one automatic feature, all operations having to do with the starting and stopping of the carbide feed must be performed by the generator attendant. For this reason, the generator is classed as non-automatic, that is, the carbide feed is not automatically governed by, or interlocked with, the immediate acetylene requirements.

The Type NA-4 generator is similar to the Type NA-5 with the addition of an Oxweld automatic booster system to deliver acetylene to the shop piping system at pressures not to exceed the permissible limit of 15 lb. per sq. in. The booster system consists of a booster pump, pressure-regulating by-pass valve, pulsation tank, mercury seal, hydraulic back-pressure valve, electric motor for diving the booster, and power-transmission equipment. The booster unit may be had with a capacity suitable for the particular installation.

WELDITE FILLET PUTTY

Weldite Fillet Putty has been offered recently to manufacturers of welded machinery and equipment by the Fusion Welding Corporation, 10257 Torrence Ave., Chicago, Illinois. The purpose of this putty is to cover weld beads and to give them a smooth finished appearance. The appearance of welded products has kept many companies from using welding to its full extent, as it was often difficult to evolve the same graceful lines which have been given to products employing castings. It is possible, by the use of



How the Appearance of Welded Articles Can Be Improved.

Weldite Fillet Putty, to benefit by the use of welding and still retain, and, in many cases, improve upon the appearance of castings. This putty is very easily applied to weld beads in any type of joints or position. It is furnished in a powder form to be mixed with water to any consistency, from paste for applying with some instrument such as a putty knife, to a consistency thin enough to be applied with a brush. Very little practice is required to enable one to apply this putty smoothly and attractively. A short time after being applied the putty becomes substantially as hard as iron, as it is essentially iron. The announcement states that eight months of commercial use has proven its ability to adhere tenaciously and not to loosen from shock or vibration.

NEW LINCOLN 600-AMPERE WELDER

A new welder with a rating of 600 amperes has recently been announced and placed on the market by The Lincoln Electric Company, Cleveland, Ohio. This new welder was developed as a result of a demand for higher welding current to be used with large size metallic and carbon electrodes. This welder is also used to supply current for the "Electronic Tornado," a process of automatic carbon arc welding. It may be had in either the portable truck type or stationary truck type. It is a motor driven, single operator, variable voltage machine and has a current range of from 180 to 750 amperes. The motor and generator are direct connected. The working mechanism of all controls are contained in a ventilated enclosed steel cabinet with hand regulators and switches mounted on a panel which forms a side of the cabinet. The control panel contains rheostat, diverter switch, safety starter switch, volt-ammeter and wing nut terminals for cables. The manufacturers state that this unified control greatly increases the simplicity of the operation of the welder. The control cabinet is mounted directly over the motor generator for easy access by the welding operator. This also permits the removal of the motor generator armature, without disturbing any other parts.

The use of a combined voltmeter and ammeter, known as a volt-ammeter, makes possible the reading of the amount of voltage and amperage on one dial and eliminates the use

New Lincoln 600-Amp. Set.

of the separate delicate ammeter which would otherwise be given excessive wear due to the large output keeping the ammeter jammed against the high limit pin on the dial. In this way, the volt-ammeter insures longer instrument life. The face of the volt-ammeter is mounted flush with the control panel, assuring the utmost protection.

Terminals for the lead cables are equipped with winged nuts, a feature which makes quick and easy connections possible, especially when it is desired to reverse the polarity of the welding current. The use of these wing nut terminals also eliminates the necessity of a switch for reversing the polarity.

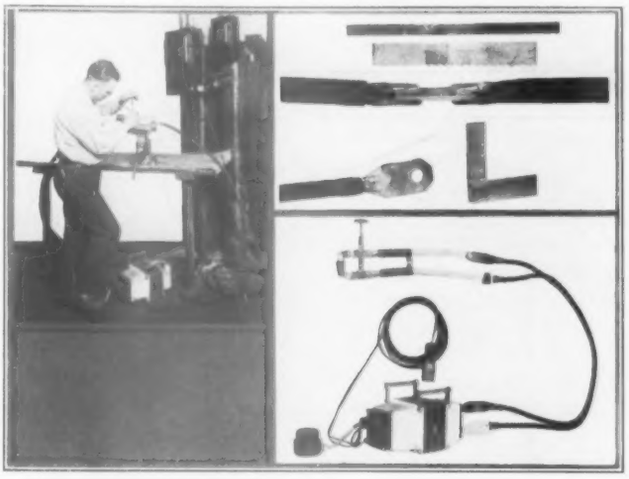
NEW ELECTRIC BRAZING EQUIPMENT USES RESISTANCE PRINCIPLE

The General Electric Company announces a new line of electric brazing equipment to have wide application in all industries. The method and equipment involved are simple and inexpensive, and have many advantages over other methods of joining metals.

Brazing with this equipment is caused by the heat generated by the flow of electricity through carbon blocks. As these blocks offer high resistance to the flow of electricity, the heat generated is correspondingly high and but small pressure is needed to complete the joint.

The equipment consists of a transformer, foot switch and tongs for holding the carbon blocks and work. The sizes of the various parts depend on the size of work to be handled and joints to be made. A typical equipment involves a 5-kv-a. transformer weighing 45 pounds, having a 220-volt primary and an 8-volt secondary. A 10-kv-a. transformer for heavier duty weighs 95 pounds, has the same primary taps and has 8-, 10- and 12-volt taps on the secondary. The secondary taps can be readily changed for different sizes of joints, the higher taps being used for larger sections.

The various parts to be brazed are either designed with



New G-E Electric Brazing Equipment and a Few Typical Jobs.

flat surfaces to begin with, or are flattened before brazing. After the work is clamped in the tongs, flux is added and the current is turned on by pressing the foot switch. When the flux melts, the brazing alloy is held against the hot metal until alloy flows into the joint by capillary attraction. During the process of brazing the hot alloy dissolves a thin film of the metal surfaces, thus forming a new alloy rich in copper and with a higher melting point than the original alloy.

Many advantages are claimed for this method over soldering. Less time is required, brazing is less expensive, and the conductivity, mechanical strength and durability are higher than those of the lead joint.

NEW WELDING ELECTRODES BY WESTINGHOUSE

The Flex-Arc Welding Electrode, a general purpose steel-welding electrode evolved by extensive experimental and development work conducted in actual welding practice, is announced by the Westinghouse Electric and Manufacturing Company. These electrodes are now used for welding the 2,000 tons of steel fabricated monthly in Westinghouse shops. Every experimental and shop test has been used to detect and overcome undesirable characteristics.

To insure absolute uniformity, each coil of wire is arc tested prior to straightening and cutting; and all processes, from steel to bundled wire, are under proper supervision to assure sustained quality and uniformity.

The reduced metal spattering effected by the use of these electrodes assures a quiet, stable, and flexible arc at both extreme low and high current values; and the easy arc manipulation gives the operator a flexible tool for vertical and overhead welding. These electrodes have a uniform melting rate which assures quick penetration and a perfectly fused bead that blends with the general appearance of the completed product.

Welds made by these electrodes are easily machined and are free from slag, oxidation, and gas inclusions. Tensile strengths ranging from 55,000 to 60,000 lb. per square

inch are consistently obtained without any special skill on the part of the operator, according to the manufacturers.

Flex-Arc sulcoat and bright finish electrodes are manufactured from steel made by the basic open-hearth process. They meet the American Welding Society Specifications E-No. 1-B.

The general welding of steel, for which Flex-Arc electrodes are recommended, represents approximately 90% of all arc welding applications and includes the following classes of work:

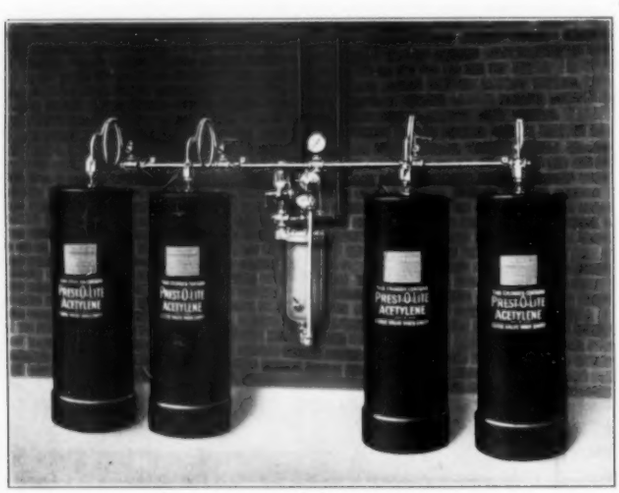
Structural steel machinery parts.
Structural fabrication, buildings, bridges, etc.
Boilers and tanks.
Fire box seams.
Pipe lines.
Low carbon steel forgings and castings.
Locomotive frames.
General building up work.
Cast iron where steel studs are used.

Flex-Arc electrodes are each stamped with the Westinghouse trademark and are packed into standard 50-pound bundles, securely wired and wrapped in burlap and properly tagged to show size, grade, heat, and number. They are carried in the following sizes: $\frac{1}{16}$", $\frac{3}{32}$", $\frac{1}{8}$", $\frac{5}{32}$", $\frac{3}{16}$", and $\frac{1}{4}$".

Leaflet 20479, published by the Westinghouse Electric and Manufacturing Company, describes Flex-Arc electrodes and contains several illustrations showing these electrodes and their applications.

NEW TYPE OXYGEN AND ACETYLENE MANIFOLDS

In order to furnish small users of oxygen and acetylene with an economical means of gas distribution, Oxweld Acetylene Company, 30 East 42nd Street, New York, has introduced the two small capacity manifolds shown in Figs. 1 and 2. Where it is necessary to have a number of welding stations and the consumption of gases is not large enough to warrant the installation of an acetylene generator and large oxygen manifold, these small manifolds will prove



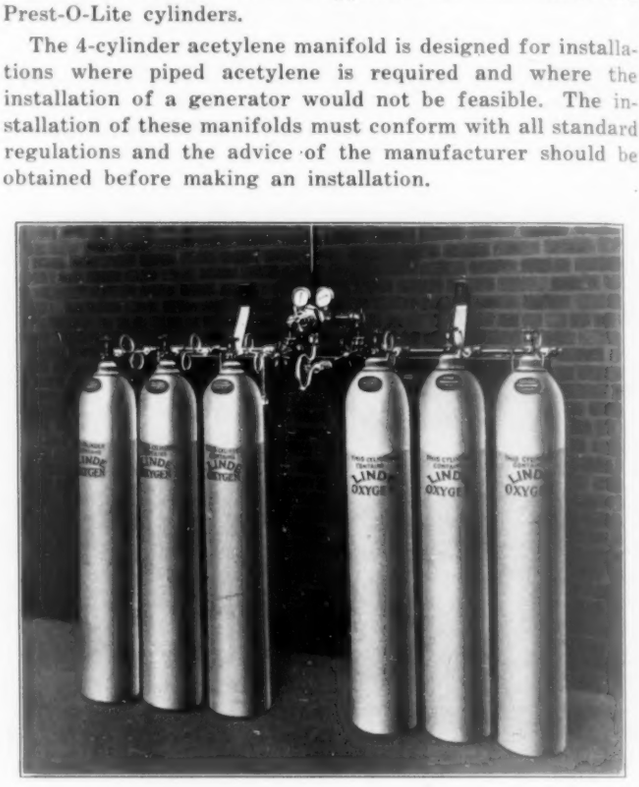
Four-Cylinder Acetylene Manifold.

to be an effective means of having a piped supply of gases.

The 6-cylinder oxygen manifold shown is of the wall type and has the duplex feature just as larger Oxweld manifolds have, so that three cylinders may be changed while the bank of three on the other side is maintaining the supply of oxygen.

The 4-cylinder acetylene manifold shown is also of the wall type. Each cylinder lead has a valve in the header so that each cylinder is independent of the others. This makes it possible to use either one, two, three or four cylinders at the same time so that a cylinder may be replaced without shutting off the acetylene supply. Each cylinder connection is fitted with the approved Prest-O-Lite Flash Arrestor. The manifold is supplied with connections for Prest-O-Lite cylinders.

The 4-cylinder acetylene manifold is designed for installations where piped acetylene is required and where the installation of a generator would not be feasible. The installation of these manifolds must conform with all standard regulations and the advice of the manufacturer should be obtained before making an installation.



Wall-Type Six-Cylinder Oxygen Manifold.

These two manifolds have been designed particularly for use by welding schools and are in use at present at a number of aircraft schools in different parts of the country. Distribution lines from the manifolds supply the gases to each welding station in a way that permits each student to work most efficiently. Because of the number of individual welding stations required in a school, the use of cylinders at each station is very inconvenient and also involves the use of so many cylinders that the matter of cylinder handling becomes a problem. The increased amount of instruction in welding being given in leading industrial and engineering schools and the establishment of schools especially to teach welding have led to the development of this new apparatus.

WILSON ANNOUNCES "RED PROCESSED" ROD FOR GENERAL ARC WELDING

The Wilson Welder & Metals Co., Inc., is now manufacturing a low-priced and exceptionally good general-purpose rod, known as Wilson Red Processed Arc-Welding Wire. This is in addition to the complete line of Wilson "Color-tipt" Arc-Welding Wire.

The "Red Processed" wire combines a fast and smooth-flowing quality with good penetration. It will produce a weld of at least 50,000 lb. per sq. in. tensile strength, and is especially recommended for general welding operations where medium ductility is required. It is supplied in 50-lb., wire-tied, burlap-wrapped bundles. Further information can be secured by writing to the manufacturers, Wilson Welder & Metals Co., Inc., P. O. Box 96, North Bergen, N. J.

BOOK REVIEW

WELD DESIGN AND PRODUCTION, by Robert E. Kinkead.

This book is primarily concerned with the problems of safe design for welding, and methods of controlling the manufacturing process to insure the production of welds which have been designed, with particular reference to the use of welding as a repetitive manufacturing process. The author has written this book for the use of experienced manufacturing executives and engineers and also for the practical operator who wants a better understanding of his job. It is assumed that the reader understands the mechanical side of welding or employs welders who do understand it. For this reason, there is more attention given to the management and engineering phases.

Instead of detailed discussions of technique, which are found in usual textbooks, there is a chapter on the subject of how welds are made, which discusses the fundamental principles of successful welding and points out the elements which interfere with good quality in the weld. The introductory chapters are particularly interesting to the plant executive and the engineer because they tell in a straightforward way just how much can be predicted regarding welding operations. This particular subject has been rather obscure for years and the author's treatment of it is exceedingly interesting and helpful. This also serves as a foundation for further discussion as to why welding is being used in a number of the important metal working industries.

The book also goes into the economic side of welding in a helpful way. The method of illustration is unique. There are no pictures of welding equipment, of operators making welds or of welded jobs. There are, however, a great many charts showing sections of all kinds of welds under all kinds of conditions. These charts are made from actual photographs and explain what happens inside the weld when it is under stress. They indicate how and where changes in weld design must be made if defective welds are to be avoided.

Mr. Kinkead has contributed a splendid original document to the literature of the industry and one which sheds much light upon questions which have been difficult to answer in the past. This new book is priced at $4.00 a copy and may be obtained from the Ronald Press Company, 15 E. 26th St., New York City, or from the publishers of *The Welding Engineer*.

NEW WELDING LITERATURE

The Linde Air Products Company, 30 East 42nd Street, New York, N. Y., has recently published two new pamphlets as a part of Linde Process Service.

"Outline Training Course for Aircraft Welders" is an outline of instructions for aircraft welders based on procedure control. This training course applies the principles of procedure control to aircraft welding, and also outlines qualification tests for aircraft welders.

"Production Welding" illustrates and describes the application of the oxy-acetylene process as a production method in a number of the more important industries. It shows clearly the application of procedure control in production operations.

BOOKLET SHOWS RELATION BETWEEN ROCKWELL AND BRINELL NUMBERS

The Bureau of Standards has recently published Research Paper No. 185 entitled "Relations Between Rockwell and Brinell Numbers" by Mr. S. N. Petrenko. The booklet describes an investigation made for the purpose of obtaining a better basis for comparing these two methods of testing materials for hardness. The experimental numbers obtained in this investigation made it possible to develop formulas for calculating Brinell numbers from Rockwell numbers and vice versa. It is stated that when used over a specified range, each of these formulas gives values in which the error to be accepted is not greater than 10%. Some formulas have also been derived which make it possible to calculate the tensile strength from the Rockwell number with the expectation of an error less than plus or minus 15%. No relationship, however, was found between the tensile strength of non-ferrous metals and their indention numbers. Copies of this paper are obtainable from the Superintendent of Documents, Washington, D. C., at 10c each.

BRITISH FIRM ISSUES CATALOG ON THEIR SPECIAL ALLOYING ELECTRODES

"A. W. P." special alloying electrodes for the welding of corrosion- and heat-resisting steels and alloys are listed in bulletin No. 60, recently issued by the Alloy Welding Processes, Ltd., Ferry Lane Works, Forest Road, London, E. 17, England. This company has worked up a considerable business in the manufacture of proprietary steel electrodes for welding the various steels manufactured by the different British steel companies. Under the name of each of these steel companies are listed the electrodes to be used with the particular company's steels. A brief discussion is also given of developments in the welding of steels and alloys and of the part played by "A. W. P." in this development.

WELDING IN THE SUGAR INDUSTRY

How welding can be used to cut costs in the sugar industry is the subject of an article in the Second Issue, 1930, of *The Pure Iron Era*, published by The Armco International Corp., Middletown, Ohio. The authors, G. T. Pearson and O. M. Menzell, describe an all-welded juice-heater and a welded evaporator, and cite examples of how the use of welding has resulted in savings on small mill parts. An article in the same issue relates how the additional cost of substituting corrosion-resisting iron plates for defective sections in the equipment and pipe lines in the Central Manati sugar mill on the north coast of Cuba was partly offset by the cheapness of efficient welded construction and ease of erection.

NEW CATALOGS BY BURKE ELECTRIC CO.

Three new pieces of literature issued by the Burke Electric Co., Erie, Pa., describe the company's arc welders, motor-generator sets for the operation of portable high-cycle tools, and general-purpose induction motors.

The arc-welding catalog is designated as bulletin No. 901 and discusses the theory of welding-current control, with special reference to the means employed in Burke welders for obtaining the desired values of what is termed "best amperes," the value of which depends on the thickness and kind of metal to be welded. The importance of the time constant, or incremental rate of variation of current, is also emphasized; and it is explained how this characteristic is incorporated in the Burke machine, partly in the generator and partly external to the generator in the form of a reactor. The self-excited fields of the generator are also pointed to as a desirable feature in the Burke welder. The volt-ampere characteristics are shown plotted in per cent of current setting against volts, and show identical action throughout the welding range of the machine, regardless of the current value for which the machine is set. Other features mentioned are the constant value of the open-circut voltage, and no variation in the welding gradient, for all current settings.

LISTS FILMS ON GAS WELDING

Nine motion-picture films on oxwelding and cutting are described in a small circular recently issued by the Union Carbide & Carbon Corp., 30 East 42nd St., New York, N. Y.

The films are available to societies, schools, clubs, and other technical and industrial groups free of charge, and are available in the 35-mm., or standard, size and the 16-mm. size. All films are of the safety, non-inflammable type, and the time required for showing is given in each case. The titles of the films are:

Oxwelding and Cutting—The Modern Method of Joining and Severing Metals; Oxwelding in Production (Parts I and II); Oxwelded Pipe Lines for Oil and Gas; Organization for Oxwelded Gas Lines; Oxwelded Industrial Piping; Oxy-Acetylene Welding of Structural Steel; Laying Multiple-Length Bronze-Welded Cast-Iron Pipe; Haynes Stelliting the Plow Share.

LEAFLET DESCRIBES STOODY GRINDERS

A folder was recently broadcast to the welding trade by the Stoody Company, Whittier, Calif., on the subject of the company's line of grinders and the new electrode holder. A letter calls attention to the durability of these grinders, and suggests to the user of Stoody welding rods that he let the Stoody Company solve his grinding and electrode-holder problems as they have already solved his welding-rod problems. Portable flexible-shaft grinders, bench-type grinders, and an oil-tool grinder and bit holder for oil-tool-fabricating plants, are described.

CATALOG OF ACETYLENE GENERATORS

Acetylene generators for cutting, welding, and lead burning, also hydraulic safety valves, carbide bins, and welders' accessories, are described and illustrated in a catalog recently published by C. S. Milne & Co., Ltd., Octavius St., Deptford, London, S. E. 8, England. Besides generators with carbide capacities varying from 7 to 180 lb., there are shown a number of smaller outfits, including a "baby generator" which is 10½ in. in diameter and 2½ ft. high, and a "first aid" cutting outfit holding a carbide charge of 3½ lb. A special generator for the cutting of cast iron is shown, this being so designed as to maintain the necessary volume and pressure of gas for this work. Among other equipment described is an outfit for the repair welder, consisting of a varied supply of welding rods and fluxes, all packed neatly in a wooden case.

NEW WILLIAMS & CO. PRICE LIST

A new price list has just been issued by Williams & Co., Inc., 901-937 Pennsylvania Ave., Pittsburgh, Pa. The list covers oxy-acetylene and electric welding wire for steel, cast iron, aluminum, etc., also flux, solders, helmets, electrode holders, and other welding supplies. Various pamphlets covering welding technique and procedure for different metals are listed for free distribution.

NEW WESTINGHOUSE AUTOMATIC ARC WELDING BULLETIN

Westinghouse Arc Welding Data No. 14, recently published by the Westinghouse Electric and Manufacturing Co., is devoted entirely to the subject of automatic arc welding. It includes discussions and illustrations of typical applications of the automatic arc welding process, together with tables showing the costs carefully itemized. Two pages at the end of the bulletin contain interesting illustrations of how arc welding can be used for ornamental work.

ARMCO ISSUES WELDING BOOKLET

The American Rolling Mill Company of Middletown, Ohio, have recently issued a handsome forty page booklet entitled "Better Welds with Armco Ingot Iron." The introductory pages discuss the properties of iron which influence it suitably for use in welded construction. Then follows a series of photographs showing products made by welding Armco Ingot iron, including water pipe, a paper mill breaker tub, furnace radiators, smoke stacks, cooling devices, pontoon tanks, milk condenser tanks, underground storage tanks and exhaust headers for Deisel engines. Several pages are devoted to tables of engineering data on this material and practical suggestions for welding which are applicable to a variety of jobs.

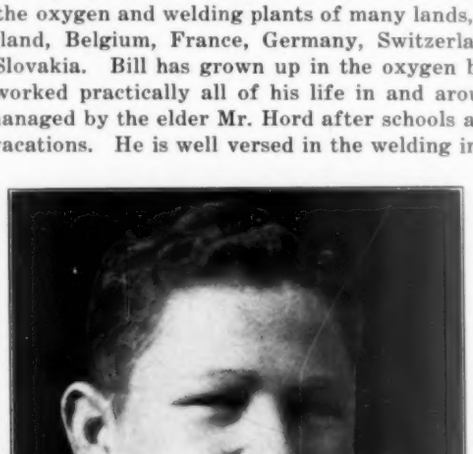
FORGED STEEL BUTT-WELDING FLANGES

Bulletin 30-5, published by the Taylor Forge & Pipe Works, describes their line of forged steel flanges designed for butt welding to pipe by either the electric or gas process. These flanges are made in five series for maximum working pressures ranging from 150 to 900 lb. per sq. in. at 750 deg. F. Prices, dimensions, and other detailed information is given concerning all sizes in each of these five series. Other flanges not listed are made for pressures up to 1,350 lb. per sq. in., and in size up to 96 in.

These flanges are said to be forged from steel of highest quality especially suited for welding, and are furnished faced, drilled, spot faced, and with the hub machine beveled for butt welding. The bulletin states that the shape of the hub more than satisfies full strength requirements, assures even transfer of heat between the pipe and flange during welding, and prevents distortion of the flange face.

YOUNG TEXAN MAKES TOUR OF EUROPEAN OXYGEN PLANTS

Bill Hord, son of S. R. Hord, the head of the Wichita Falls Oxygen Company, Wichita Falls, Texas, is now on a tour visiting the oxygen and welding plants of many lands, including England, Belgium, France, Germany, Switzerland and Czecho-Slovakia. Bill has grown up in the oxygen business having worked practically all of his life in and around the plants managed by the elder Mr. Hord after schools and during his vacations. He is well versed in the welding industry,



BILL HORD

particularly in Texas. He recently inspected several oxygen and welding plants in Canada and through the courtesy of Mr. Minor and Mr. Taylor of the Wm. Wharton Cylinder Company arrangements were made for him to visit the European plants which are on his list. S. R. Hord was for years manager of the Burdett Oxygen Company plant at Ft. Worth and is now an official of the Texas Acetylene Company as well as being president of the Wichita Falls Oxygen Company.

NEW ARMCO APPOINTMENTS

Effective August 1, 1930 Mr. A. F. Murphy was appointed works manager of the Zanesville Division of The American Rolling Mill Company at Zanesville, Ohio. Zanesville will now be operated as a separate unit, one of Armco's four manufacturing divisions. These are located at Ashland, Kentucky; Middletown, Ohio; Butler, Pennsylvania, and at Zanesville. Each is in charge of a resident works manager. Heretofore Zanesville has been a part of the Middletown Division. Mr. S. R. Rectanus is vice-president in charge of operations.

Mr. L. F. Reinartz, assistant general superintendent since 1923, has been appointed works manager of the Middletown Division of The American Rolling Mill Company, effective August 1, 1930. He will be in charge of operations at East Works and Central Works in Middletown, Ohio.

The position of general superintendent has been created for the Middletown Division of the American Rolling Mill Company and Mr. G. D. Tranter, open hearth superintendent, selected to fill it. The appointment of Mr. S. E. Graeff as assistant general superintendent at Middletown was also announced recently.

NEW FOUNDRY FOR HAYNES STELLITE CO.

The Haynes Stellite Co., Kokomo, Ind., a unit of the Union Carbide & Carbon Corp., has announced the completion of a new foundry at the Kokomo works, which has been built expressly for the manufacture of the Hastelloys, a group of acid-resistant alloys. The most up-to-date and efficient foundry equipment procurable has been installed to insure careful control of quality and uniformity of product. The Hastelloys are of particular interest to chemical engineers and others who have been faced with the hitherto difficult problem of providing suitable equipment for resisting the action of hydrochloric acid and moist chlorine. Hastelloy "A" resists the action of both hot and cold hydrochloric acid, while Hastelloy "C" resists the action of wet chlorine.

The production of these alloys, facilitated by the opening of this new foundry, will be of interest not only to the chemical and process industries but to all industries in which the handling of acids is a problem. Information with regard to the Hastelloys may be obtained from the various offices of the Haynes Stellite Co. or by writing to their general offices in Kokomo, Ind.

NEWS OF THE INDUSTRY

J. E. Waddle of Gonzales, Calif., recently opened a welding shop in that city, which will be operated as the Gonzales Welding Works. He will specialize in welding and repairing of tractor equipment. He will be equipped to handle both electric and acetylene welding, a new U. S. L. electric arc welder having been installed at the opening of the plant.

George Bachmann and Adolph Baumann recently opened a new shop in San Francisco at 135 Spear St., which will be known as the Spear Street Welding Works. They are equipped for general contract and repair welding, a modern 300-amp. U. S. L. electric arc welder being selected as part of the initial equipment.

Three units are being added by the Texas Oil Co. to their Gasoline Plant 9-C in Santa Fe Springs, Calif. Three 440-hp. Clark engines are being installed, which addition brings the total units of the plant to 39. This plant now has one of the largest engine rooms in the United States. The welded portion of the installation work was of both acetylene and electric arc.

The Guiberson Corp., of Dallas, Tex., and Los Angeles, Calif., has established a welding and machine shop at 519 S. W. 29th St., Oklahoma City, Okla., for servicing its own tools used in the Oklahoma City oil field. A shop building, 40x50 ft., has just been completed. Dave Bell, formerly welding foreman at the Los Angeles plant, has been placed in charge.

The Carson Machine Works, Oklahoma City, Okla., has changed its name to the Carson Machine & Supply Co. It specializes in the repair of oil-field generating equipment and is a distributer for several manufacturers.

The American Tank Co., a subsidiary of Black, Sivalls & Bryson, Inc., has completed and moved into its all-welded sheet-steel plant at 2121 Westwood Ave., Oklahoma City, Okla. Simultaneously with removal to the new plant, the company announced it had changed its name to the American Tank & Equipment Corp.

A baseball team picked from the Middletown, Ohio, plant of the American Rolling Mill Co. defeated the team representing the Fisher Body Co., of Cleveland, by a score of 2 to 1 in a game played on July 26th. It is rather unusual for teams representing customer and manufacturer to meet in an athletic contest, but the idea has good possibilities in the way of bringing about acquaintances and understanding between organizations. A return game has been scheduled at Middletown for Saturday, August 23rd, at which time the Armco organization will entertain officers of the Fisher Body Co. and others who go to Middletown to witness the game.

The Welding Engineering and Research Corp. recently moved its offices from 30 Church St. to 25 West 43rd St., New York City. The new headquarters are in room 2001 at that address.

Alloy Welding Processes, Ltd., London, England, have been so impressed by the success of the house organ which they call the "Welder" that they have recently made arrangements to publish it monthly instead of bi-monthly as originally planned.

Harry M. Frederick, manager of the Security Welding Co., Minneapolis, reports increasing demands by customers for hard-facing. He states, however, that in building up a hard-facing business it is necessary for the job shop manager to put forth some real sales effort.

The Owen Electric Manufacturing Co. report that on two recent comparative tests they placed two 200-amp. Owen welders with a large shipbuilding company in New Jersey and one 200-amp. machine with a shipbuilding company in Virginia.

It is reported that the Federal Machine & Welder Co., Warren, Ohio, are planning to erect new buildings to increase their operating capacity over 100% and to install new equipment, the total amount of this construction and installation work being estimated at $250,000.

The Grand Rapids Welding Supply Co., Grand Rapids, Mich., are just completing a new carbide storage warehouse and a new engine house, and have installed a new Fairbanks-Morse Diesel engine which will furnish the power for the production of oxygen. At their Kalamazoo plant they have recently completed an addition to their warehouse which was necessitated by a constant growth in their business in that locality. The improvements both at Grand Rapids and Kalamazoo represent an investment of approximately $25,000.

Practically the whole of the issued shares of Alloy Welding Processes Limited, of Ferry Lane, Walthamstow, England, have been purchased by Messrs. Murex Limited, who possess works at Rainham, Essex, and whose business is the treatment of complex ores and the manufacture of various alloys and of carbon free metals. Messrs. Murex Limited own all

the share capital of the Premier Electric Welding Co., Ltd., also that of the Thermit Ltd. The works of the Premier Electric Welding Co., Ltd., will shortly be removed to the works of Alloy Welding Processes Limited, as the latter company have ample space to accommodate them in their new factory, of which they only took possession about eighteen months ago.

The Standard Gasoline Co., of southern California, are installing a new low-pressure booster plant in the Santa Fe Springs oil field. The plant will consist of eight units—four Bessemer and four Western engines of 165 hp. each. Installation and connections of all pipe, etc., will be acetylene welded. The plant will be known as Plant No. 5.

Lukenweld, Inc., Division of Lukens Steel Co., Coatesville, Pa., announces the appointment of Everett Chapman to the position of Director of Development and Research. Mr. Chapman will have general direction of laboratory and investigation work in connection with redesigning of machinery parts for the welded steel type of construction. Mr. Chapman received his Master of Science degree from the University of Michigan in 1924. After a year at Purdue, he became Director of Research for the Lincoln Electric Co. of Cleveland. In the course of this work he invented the Electronic Tornado welding process and carried out extensive research work in the metallurgy of welding. His recent studies have been along the lines of determining the most economical methods of using material in welded steel structures.

The Standlee Oil Co., of Long Beach, Calif., has opened a welding shop in the Signal Hill oil field. The shop is located in the north extension of the field, which is the center of the greatest development at this time. The shop will handle the servicing of the company's drilling equipment in that field.

The Union Tank & Pipe Co., of Los Angeles, Calif., have erected an addition to their welding shop in their plant at 23rd St. and Santa Fe Ave. The building is of welded structural steel and pipe, and adds much in up-to-date convenience to this department.

The Isley Iron Works of Los Angeles, Calif., have appointed Jim Montgomery as plant superintendent to replace A. Dalstrom who recently resigned to open a private welding shop. The Isley Iron Works specialize in structural steel.

The Northwest Supply Co., 322 Sixth Avenue, South, Minneapolis, Minn., has recently been formed by D. B. Berg and A. L. Berg. They are planning to handle a complete line of oxy-acetylene and electric apparatus and supplies and are planning a very thorough sales effort in the twin city district and surrounding territory.

The Masters Welding Works of Signal Hill, Calif., have leased their branch shop at Inglewood to Ellis, Miller and Ward, who will operate the shop in the future under the name of the E. M. & W. Welding Works. The new managers of the shop will continue the usual oil-field welding service, specializing in hardfacing of hard-formation oil-well digging bits.

The Flemming Forge and Iron Works of Long Beach, Calif., have recently installed a new 300-amp. Hobart electric welder in their new shop located at 1570 Anaheim St. The shop until a few months ago was located at Anaheim and Cherry Ave. The shop features general machine work, structural steel and all kinds of welding. D. B. Flemming is owner and manager.

W. M. Bastable has just been appointed as distributor for the U. S. L. electric arc welding equipment in the New York metropolitan district, with headquarters at 505 Fifth Ave., New York City. For a number of years Mr. Bastable was sales manager for the Wilson Welder & Metals Co. He has more recently been active in the field as a welding contractor.

Jack Pettit, owner and manager of the Calazon Welding Shop at 2477 E. Florence Ave., Los Angeles, Calif., is closing out his business at that location. No report is available as to the shop being reopened. Mr. Pettit is preparing to enter the marine gas engine and equipment work at Wilmington, in which business he has had over thirty years of experience.

F. E. Heath, of Pasadena, Calif., is the new owner and manager of the Clark Welding Works of that city. The shop is located at 78 North Delacy, and will continue to be operated under the name of the Clark Welding Works. Mr. Heath is well known in this territory, having been connected in different phases of welding and metal work for sixteen years in and near Los Angeles. For nine years he was with the Baker Iron Works, of Los Angeles, and during the World War was Welding Instructor in the Polytechnic High School of Los Angeles. The usual general gas and electric welding work of all kinds will be featured as in the past. Mr. Clark, retiring manager, announces no definite plans for the immediate future, except a vacation in the mountains during the summer.

The Plymouth Oil Co., of Signal Hill, Calif., has opened a welding shop for servicing the company's drilling equipment and other general welding repair work in that field.

The E. M. F. Electric Co. Pty. Ltd., of Melbourne, Australia, intend to commence operations in the United States of America in the very near future on the manufacture and distribution of covered electrodes. The above company is one of the leading firms in the electric-welding industry in Australia and, in addition to the great demand for their products in Australia, large quantities of E. M. F. electrodes are exported to South Africa, India and New Zealand.

The Baker Oil Tool Corp., of Huntington Park, Calif., has recently added a new 600-amp. Lincoln electric welder, and a new 300-lb. Airco-Davis-Bournonville acetylene generator to their welding shop equipment, also three new Victor acetylene outfits. The Baker company manufactures oil-well rotary digging bits and other oil-well tools and equipment. Present activity in their plant indicates considerable improvement in business.

The welding shop of the Texas Oil Co. in Santa Fe Springs, Calif., is being closed, and the equipment moved to the company's headquarters at Signal Hill in the Signal Hill field. All future welding work for the company in this district will be handled from the Signal Hill headquarters.

Classified Ads

Help Wanted—75c per line, minimum 4 lines.
Jobs Wanted—4 lines free.
Other Ads—$1.00 per line, minimum 4 lines.
Count 8 words to line. Add 6 words for keyed address.

Representative Salesmen Wanted, to sell our line of specialty welding electrodes. Must be financially able to carry small stock. Ketchbaw Engineering Service, 4518 Clarendon Ave., Chicago, Ill.